Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

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FAKTOR RISIKO ANEMIA PADA WANITA USIA SUBUR DI DAERAH PERTANIAN HORTIKULTURA

THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS

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ABSTRACT

Anemia continues to be an important and widespread public health problem, so it must be addressed. Around 1.74 (1.72-1.76) billion world population suffer from anemia, especially children under five, women of childbearing age (WUS) and pregnant women. Anemia has an impact on loss of productivity, cognitive impairment, susceptibility to infection, and increases the risk of complications of pregnancy and childbirth. The study was conducted with a cross-sectional design, involving 160 participants in the horticultural farming area in West Lampung Regency. Data analysis used Chi-square, Odds Ratio, and Logistic Regression (alpha=0.05). The results of the study found that anemia in women of childbearing age was 27.5%. The study also found three risk factors for anemia, namely poor nutritional status (OR=9,96), insufficient protein intake (OR=22,60), and insufficient intake of high-iron vegetables (OR=10,73). Nutritional interventions should emphasize increasing intake of protein, iron and vitamins, both through improving the diet, fortification and supplementation of Fe tablets.

Keyword: Anemia, women of reproductive age, farmers, protein, iron

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, wanita usia subur (WUS) dan wanita hamil. Anemia berdampak pada hilangnya produktivitas, gangguan kognitif, kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan di daerah pertanian hortikultura di Kabupaten Lampung Barat. Analisis data menggunakan Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan anemia pada wanita usia subur sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia, yaitu status gizi yang kurang baik (OR=9,96), kurang asupan protein (OR=22,60), dan kurang asupan sayuran tinggi zat besi (OR=10,73). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

Kata kunci : Anemia, wanita usia subur, petani, protein, zat besi

LATAR BELAKANG

Anemia masih menjadi masalah kesehatan masyarakat yang sangat penting di seluruh dunia, terutama di negara-negara berkembang. Anemia berkontribusi pada peningkatan morbiditas dan mortalitas,

penurunan produktivitas kerja, gangguan perkembangan *neurologis*, serta risiko komplikasi kehamilan dan persalinan (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Teshale et al., 2020). Dalam jangka panjang, anemia berdampak besar terhadap kondisi kesehatan, ekonomi, dan kesejahteraan sosial (Priyanto, 2018; Teshale et al., 2020). Pada tahun 2019, anemia menyebabkan 58,6 (40,14-81,1) juta tahun hidup dengan disabilitas *(YLDs = Years Lived with Disability)* (Gardner & Kassebaum, 2020).

Situasi anemia di Indonesia menunjukkan lebih banyak diderita pada wanita (27,2%) dibandingkan pria (20,3%), tinggal di pedesaan (25,0%) dibandingkan perkotaan (22,7%) (Kemenkes RI, 2018a). Demikian pula pada kelompok rentan, anak balita (38,5%), WUS (22,7%), dan wanita hamil (48,9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia pada ibu hamil meningkat dari 37,1% (2013) menjadi 48,9% (2018) (Kemenkes RI, 2018a). Sementara, pada kelompok WUS juga terjadi peningkatan dari 19,7% (2007) menjadi 22,7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Lebih dari separuh kasus anemia di dunia disebabkan kurangnya zat besi yang berperan dalam *erythropoiesis* dan pembentukan *hemoglobin*. Faktor gizi lain yang ikut berperan adalah kurang asupan protein, folat, vitamin-A, vitamin-B, vitamin-C, dan seng (Gardner & Kassebaum, 2020; Pasalina et al., 2019; Sahana & Sumarmi, 2015; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019). Berdasarkan SK Menteri Kesehatan RI Nomor 736a/Menkes/ XI/1989, seseorang wanita dewasa dinyatakan anemia jika kadar *hemoglobin (Hb)* dalam darah dibawah normal, yaitu kurang dari 12,0 g/dL, sedangkan pada wanita hamil kurang dari 11,0 g/dL (Kemenkes RI, 2020).

Anemia berkontribusi pada peningkatan morbiditas dan mortalitas, penurunan produktivitas kerja akibat mudah lelah, penurunan kognitif, dan gangguan perkembangan *neurologis* (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b). Pada kehamilan, anemia meningkatkan risiko pendarahan, kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi berat rendah (BBLR) dan pendek *(stunted)*, serta menjadi penyebab kematian ibu tidak langsung (Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta et al., 2020; Yushananta & Ahyanti, 2022).

Selain dipengaruhi oleh masalah gizi dan fisiologis, anemia juga dapat dipengaruhi oleh faktor lingkungan, salah satunya adalah keracunan pestisida. Keracunan pestisida menyebabkan gangguan sistem saraf (seperti sakit kepala, *paresthesia, tremor, diskoordinasi*, kejang) akibat akumulasi *asetilkolin* di saraf jaringan dan pada organ vektor. Dalam jangka panjang *(kronis)*, menyebabkan berat badan menurun, *anemia, anorexia*, dan gangguan fungsi hati (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020).

Penggunaan pestisida terbesar terutama pada pertanian, hortikultura yang menggunakan pestisida dalam dosis besar dan terus menerus selama musim tanam (Yushananta et al., 2020). Kabupaten Lampung Barat merupakan daerah pertanian hortikultura terluas di Provinsi Lampung dan sebagai sumber pendapatan terbesar daerah (53,81% PDRB). Luas lahan pertanian hortikultura mencapai 1.254 Ha dengan produksi berupa sayuran sebesar 237.500 ton (BPS, 2019). Hingga saat ini masih sedikit penelitian yang

membahas anemia pada WUS yang bekerja dengan paparan pestisida. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura.

METODE

Studi *cross sectional* dilakukan di Kabupaten Lampung Barat, untuk mengetahui faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Tiga kecamatan sebagai sentra pertanian utama hortikultura dipilih mengikuti luas daerah pertanian dan jumlah produksi pertanian hortikultura (BPS, 2019), yaitu Kecamatan Balik Bukit, Sukau dan Sekincau.

Penelitian dilakukan dari Juli hingga Agustus 2019. Wanita usia subur berusia 15-49 tahun dipilih secara *purposive*. Wanita yang sedang hamil, memiliki kelainan darah, mengkonsumsi obat yang dapat menghambat penyerapan zat besi dikeluarkan dari penelitian. Responden dinyatakan anemia, jika kadar *Hb* darah <12 gr/dL dan normal jika kadar *Hb* darah ≥ 12 gr/dL (Kemenkes RI, 2020).

Sampel dihitung berdasarkan *infinite population*, dengan prevalensi anemia pada WUS hasil penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Perhitungan jumlah sampel mengikuti formula sebagai berikut:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \cdot P \cdot (1-P)}{d^2}$$

dimana, n = jumlah sampel, P = proporsi atribut (0,227), d = presisi (10%), 1 - P = proporsi non atribut (0,511), $Z_{1-\alpha/2}$ = Nilai Z pada alpha 5% (1,96). Hasil perhitungan jumlah sampel minimal sebanyak 68 orang wanita usia subur. Namun, pada penelitian ini dilakukan pengambilan data terhadap 160 orang sampel. Sehingga presisi (d) meningkat menjadi 6,5%.

Data dimasukkan ke dalam SPSS (24.0) setelah diperiksa kelengkapannya, diedit, dan diberi kode. Analisis *univariate* digunakan untuk menggambarkan distribusi setiap variabel penelitian dengan frekuensi dan proporsi. Analisis *bivariate* menggunakan statistik *Chi-square* untuk mengukur variabel yang terkait dengan anemia. Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko. Untuk mengetahui hubungan antara faktor risiko dan anemia, digunakan analisis *Logistic Regression*. Perhitungan *Odds Ratio (OR)* dan *Confident Interval (CI)* 95% juga dilakukan. Semua uji statistik, p-value ≤ 0,05 dianggap signifikan.

HASIL DAN PEMBAHASAN

Hasil penelitian (Tabel 1) mendapatkan sebanyak 27,5% wanita usia subur yang bekerja pada pertanian hortikultura menderita anemia. Proporsi responden dengan status gizi baik (54,4%), sedikit lebih besar dibandingkan yang kurang baik (45,6%). Dari seluruh responden (n=160), mayoritas responden (81,9%) pernah hamil lebih dari satu kali *(multigravida),* dan (73,8%) melahirkan bayi hidup lebih dari satu kali *(multipara),* sehingga berisiko mengalami anemia.

Tabel 1 juga menggambarkan kebiasaan makan dan jenis makanan yang biasa dikonsumsi responden. Berdasarkan hasil wawancara, mayoritas responden (71,3%) telah mengkonsumsi protein dalam jumlah yang cukup. Namun, ditemukan 28,8% yang masih mengalami kekurangan. Jenis lauk sebagai sumber protein dan zat besi yang sering dikonsumsi adalah ikan, telur dan daging. Sebanyak 71,9% responden telah mengkonsumsi jenis sayuran hijau yang tinggi kandungan zat besi, antara lain daun singkong, kangkung, genjer, daun pepaya, sawi, dan daun labu. Demikian pula pada konsumsi buah, mayoritas (78,8%) telah mengkonsumsi jenis buah-buahan tinggi

kandungan vitamin-C dan vitamin-A, seperti jeruk, mangga, pisang, dan pepaya.

Tabel 1
Karakteristik Responden

Variabel	Frekuensi (n)	Persen (%)
Status Anemia		
Anemia	44	27,5
Normal	116	72,5
Status Gizi		
Kurang Baik	73	45,6
Baik	87	54,4
Jumlah Kehamilan		
Berisiko	131	81,9
Baik	29	18,1
Jumlah Kelahiran		
Berisiko	118	73,8
Baik	42	26,3
Konsumsi Protein		
Kurang	46	28,8
Baik	114	71,3
Konsumsi Sayuran		
Kurang	45	28,1
Baik	115	71,9
Konsumsi Buah		
Kurang	34	21,3
Baik	126	78,8

Dari Tabel 2 terlihat bahwa pada kelompok yang menderita anemia, sebesar 42,5% memiliki status gizi yang kurang baik. Hasil analisis menunjukkan hubungan yang signifikan antara status gizi dengan kejadian anemia ($p<0,05$).

Berdasarkan jumlah kehamilan dan kelahiran, proporsi penderita anemia lebih besar pada kelompok yang pernah hamil lebih dari satu kali (25,2%) dan pernah melahirkan lebih dari satu kali (24,6%). Namun, hasil statistik tidak menunjukkan hubungan yang bermakna pada kedua variabel ($p>0,05$).

Kurang konsumsi protein menunjukkan hubungan yang signifikan ($p<0,05$) dengan anemia. Demikian pula pada konsumsi sayuran hijau dan buah, juga menunjukkan hubungan yang sangat signifikan dengan kejadian anemia pada WUS yang bekerja pada pertanian hortikultura ($p<0,05$).

Tabel 2
Uji Chi-square karakteristik responden dan anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frekuensi	(%)	Frekuensi	(%)	
Status Gizi					
Kurang Baik	31	42,5%	42	57,5%	0,000
Baik	6	6,9%	81	93,1%	
Jumlah Kehamilan					
Berisiko (> 1 kali)	33	25,2%	98	74,8%	0,283
Baik (1 kali)	4	13,8%	25	86,2%	
Jumlah Kelahiran					
Berisiko (> 1 kali)	29	24,6%	89	75,4%	0,605
Baik (1 kali)	8	19,0%	34	81,0%	
Konsumsi Protein					
Kurang	29	63,0%	17	37,0%	0,000
Baik	8	7,0%	106	93,0%	
Konsumsi Sayur					
Kurang	25	55,6%	20	44,4%	0,000
Baik	12	10,4%	103	89,6%	
Konsumsi Buah					
Kurang	16	47,1%	18	52,9%	0,000
Baik	21	16,7%	105	83,3%	

.

Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko, serta mengetahui hubungan antara faktor risiko dan anemia. Analisis dilakukan dengan *Logistic Regression* (alpha=0,05).

Tabel 3.
Uji Logistic Regresi pada faktor risiko anemia

Variables	Anemia Frekuensi (%)	Normal Frekuensi (%)	Odds Ratio (95% CI)
Status Gizi			
Kurang Baik	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)
Baik	6 (6,9%)	81 (93,1%)	1
Konsumsi Protein			
Kurang	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)
Baik	8 (7,0%)	106 (93,0%)	1
Konsumsi Sayur			
Kurang	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)
Baik	12 (10,4%)	103 (89,6%)	1

Pada analisis (Tabel 3) mendapatkan tiga faktor risiko terhadap kejadian anemia pada WUS yang bekerja di pertanian hortikultura di Kabupaten Lampung Barat, yaitu status gizi, konsumsi protein, dan konsumsi sayur. Status gizi kurang baik meningkatkan risiko anemia sebesar 9,96 kali (3,85-25,77). Kurang konsumsi protein berisiko terhadap kejadian anemia sebesar 22,60 kali (8,87-57,59). Sementara, kurang konsumsi sayur hijau menunjukkan risiko 10,73 kali (14,64-24,82).

Hasil penelitian mendapatkan prevalensi anemia pada WUS yang bekerja pada pertanian hortikultura sebesar 27,5% (Tabel 1). Hasil ini lebih besar dibandingkan beberapa laporan penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). Kondisi ini berpotensi meningkatkan morbiditas dan mortalitas, gangguan perkembangan *neurologis*, penurunan produktivitas akibat mudah kelelahan, mudah sakit, dan gangguan kognitif (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b; Teshale et al., 2020).

Anemia pada kelompok WUS juga akan meningkatkan risiko mengalami anemia pada saat kehamilan, sehingga berpotensi menimbulkan komplikasi kehamilan dan persalinan (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Komplikasi kehamilan antara lain kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi BBLR dan *stunted* (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta & Ahyanti, 2022).. Sedangkan komplikasi persalinan adalah pendarahan yang dapat menyebabkan kematian ibu (Chrispinus Siteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Anemia pada remaja dan WUS akan berlanjut pada masa kehamilan (Azwar, 2004), sehingga menjadi *independent predictor* anemia pada masa kehamilan (Demmouche et al., 2011). Masalah gizi pada kelompok umur tertentu akan mempengaruhi status gizi pada periode siklus kehidupan berikutnya *(intergenerational impact)* (Azwar, 2004; Demmouche et al., 2011). Sehingga upaya pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Penelitian telah membuktikan bahwa status gizi menjadi salah satu faktor risiko anemia

(OR=9,96; 95%CI 3,85-25,77). Hasil penelitian ini konsisten dengan beberapa penelitian sebelumnya yang menyatakan bahwa status gizi berhubungan erat dengan kejadian anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway et al., 2020; Sudikno & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Status gizi ditentukan berdasarkan penghitungan indeks massa tubuh (IMT), selanjutnya dikategorikan menjadi kurus (IMT <18,5 kg/m^2), normal (IMT 18,5-22,9 kg/m^2), gemuk (IMT 23,0-24,9 kg/m^2), obesitas I (IMT 25,0-29,9 kg/m^2), dan obesitas II (IMT ≥ 30,0 kg/m^2) (Kanazawa et al., 2005). Pada penelitian ini, kasus anemia lebih banyak ditemukan pada WUS dalam kategori kurus. Hasil penelitian ini sesuai dengan hasil penelitian sebelumnya yang menyimpulkan bahwa penderita anemia lebih banyak ditemukan pada WUS dengan kategori kurus (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Kebutuhan nutrisi dan usia berkaitan dengan kejadian anemia. Secara etiologi, bertambah usia akan diikuti dengan penurunan *progenitor eritroid* sumsum tulang, sehingga terjadi menurunkan jumlah sel darah merah yang dilepaskan ke peredaran darah. Penurunan sumsum tulang dimulai pada usia 30 tahun sebanyak 30% dan meningkat hingga 50% pada usia di atas 60 tahun (Mahlknecht & Kaiser, 2010). Tidak terpenuhinya kebutuhan gizi menyebabkan penurunan produksi sel darah merah, sehingga terjadi anemia (Demmouche et al., 2011; Mantika & Mulyati, 2014). Status gizi dan anemia memberikan gambaran malnutrisi kronik (Azwar, 2004).

Pada penelitian ditemukan bahwa konsumsi protein dan sayuran tinggi zat besi sebagai faktor risiko terjadinya anemia (Tabel 3). Kurang konsumsi protein memberikan risiko 22,60 kali (8,87-57,59), dan kurang konsumsi sayuran tinggi zat besi memberikan risiko 10,73 kali (14,64-24,82). Kekurangan asupan protein dan zat besi merupakan penyebab utama dari anemia, selain defisiensi vitamin-A, vitamin-B, vitamin-C, infeksi dan *thalassemia* (Chaparro & Suchdev, 2019). Rendahnya asupan protein, energi, dan zat besi dalam makanan merupakan faktor utama yang dapat memicu terjadinya anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Zat besi banyak terdapat pada makanan seperti daging, ikan dan unggas (*heme iron*) dan pada tumbuhan seperti sayur, buah dan biji-bijian (*nonheme iron*). Zat besi yang berasal dari *heme* lebih mudah diserap oleh tubuh dibandingkan *non heme* (Mantika & Mulyati, 2014). Defisiensi zat besi menyebabkan simpanan zat besi dalam tubuh menjadi berkurang, sehingga suplai ke sumsum tulang untuk pembentukan *hemoglobin* menjadi tidak tercukupi. Akibatnya, jumlah eritrosit *protoporfirin* bebas meningkat, sehingga terjadi produksi *eritrosit mikrositik* dan nilai *hemoglobin* menjadi turun (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Pekerjaan pada pertanian hortikultura memberikan risiko paparan pestisida dalam jumlah yang besar yang berakibat keracunan (Sulistyawati et al., 2019; Yushananta et al., 2020). Pestisida termasuk dalam kelompok bahan beracun berbahaya (B3) dan golongan *Endocrine Disrupting Chemicals (EDCs)* yaitu senyawa kimia yang dapat mengganggu *sintesis, sekresi, transpor, metabolisme,* aksi pengikatan dan penghapusan hormon alami yang berfungsi untuk menjaga *homeostasis, reproduksi* dan proses tumbuh kembang (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia menjadi salah satu dampak jangka panjang dari keracunan pestisida (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018;

Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). Pembentukan senyawa *sulfhemoglobine* dan *methemoglobine* dalam darah akibat keracunan pestisida menyebabkan penurunan kadar *hemoglobin* dalam sel darah merah yang mengakibatkan terjadinya anemia (Britt & Budinky A, 2000; George et al., 2014; G. Nutakki et al., 2017; G. S. Nutakki et al., 2016; Pinkhas & All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

Pada penelitian ini diketahui bahwa makanan sumber protein yang dikonsumsi adalah ikan, telur, dan daging. Sedangkan jenis sayuran dominan berupa sayuran hijau. Namun sekitar 28,8% dan 28,1% (Tabel 1) mengkonsumsi dalam jumlah yang tidak mencukupi. Kurangnya jumlah konsumsi, kesulitan penyerapan zat besi *non-heme,* serta paparan pestisida diduga sebagai penyebab tingginya prevalensi anemia di lokasi penelitian. Diperlukan upaya untuk meningkatkan jumlah asupan protein, zat besi, dan nutrisi mikro lainnya melalui pemilihan makanan yang baik serta perbaikan menu makanan. Penyerapan zat besi dapat tercapai secara optimal jika sajian terdiri dari kombinasi bahan pangan yang mengandung zat besi tinggi pada hewani *(heme)*, sayur-sayuran *(non-heme)*, vitamin-A, vitamin-B, dan vitamin-C (Balarajan et al., 2011; Basith et al., 2017; Bharati et al., 2008; Ghosh et al., 1980; Prihartono et al., 2011). Pemilihan makanan yang baik diharapkan dapat mencegah atau mengatasi anemia (Stephen et al., 2018). Upaya upaya *fortifikasi* dan *suplementasi* tablet *Fe* menjadi bagian yang penting untuk terus dilakukan oleh otoritas kesehatan kepada WUS. Pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

KESIMPULAN DAN SARAN

Anemia terus menjadi masalah kesehatan masyarakat yang meluas dan signifikan, sehingga harus ditangani secara memadai. Hasil penelitian mendapatkan tiga faktor risiko anemia, yaitu status gizi yang kurang baik (OR=9,96; 95%CI 3,85-25,77), kurang asupan protein (OR=22,60; 95%CI 8,87-57,59), dan kurang asupan sayuran tinggi zat besi (OR=10,73; 95%CI 14,64-24,82). Meningkatkan asupan protein dan zat besi menjadi intervensi yang harus segera dilaksanakan, baik melalui pemilihan makanan dan perbaikan menu makanan.

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Conflict of Interest

Author menyatakan tidak ada conflict of interest.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

2. Pemberitahuan hasil review-1 (17 Maret 2021)

[jika] Editor Decision

Editorial Office <jurnal.aisyah@gmail.com> 17 Maret 2021 pukul 06.34
Kepada: Prayudhy Yushananta <prayudhyyushananta@gmail.com>
Cc: Yetti Anggraini <yettianggraini@poltekkes-tjk.ac.id>, Mei Ahyanti <mei.ahyanti@gmail.com>, Iwan Sariyanto <sariyantoiwan@yahoo.co.id>

Dear Mr. Prayudhy Yushananta and colleague:

We have reached a decision regarding your submission to Jurnal Aisyah : Jurnal Ilmu Kesehatan, "THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS".

Based on the initial review by the editor, we ask the author to complete the manuscript as follows:

- Add a title page to the manuscript (see manuscript templates)
- The authors asked to (this is mandatory) provide 2 potential reviewers recommended by the author (see manuscript templates).
- Writing citations and bibliography follow Jurnal Aisyah policies, use a reference manager (Mendeley, Endnote, Zotero, etc)

Read carefully the author guidelines and publication templates to avoid rejection of manuscripts that do not comply with Jurnal Aisyah's guidelines and policies.

The revised manuscript can be uploaded to the author's version by logging in using the account that has been used to make the submission of the manuscript. Thank you for your cooperation.

Warmest Regards.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

3. Perbaikan hasil review-1 (20 Maret 2021)
   - Pemberitahuan pengiriman perbaikan hasil review-1
   - Manuskrip hasil perbaikan hasil review-1

[jika] Editor Decision

Prayudhy Yushananta <prayudhyyushananta@gmail.com> 20 Maret 2021 pukul 23.03
Kepada: Editorial Office <jurnal.aisyah@gmail.com>

Assalamualaikum Wr. Wb.

Saya telah mengirimkan perbaikan manuskrip sesuai template terbaru, serta beberapa perbaikan lainnya, termasuk perbaikan pada metadata.
Daftar nama reviewer juga sudah disertakan, pada bagian akhir naskah.
Terima kasih atas masukannya. Mudah-mudahan sudah sesuai dengan standar JIKA, sehingga dapat diterima dan diterbitkan.

Terima kasih. Salam hangat dan sehat selalu..
Wassalamualaikum Wr.Wb.
[Kutipan teks disembunyikan]

FAKTOR RISIKO ANEMIA PADA WANITA USIA SUBUR DI DAERAH PERTANIAN HORTIKULTURA

THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS

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FAKTOR RISIKO ANEMIA PADA WANITA USIA SUBUR DI DAERAH PERTANIAN HORTIKULTURA

THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS

ABSTRACT

Anemia continues to be an important and widespread public health problem, so it must be addressed. Around 1.74 (1.72-1.76) billion world population suffer from anemia, especially children under five, women of childbearing age (WUS) and pregnant women. Anemia has an impact on loss of productivity, cognitive impairment, susceptibility to infection, and increases the risk of complications of pregnancy and childbirth. The study was conducted with a cross-sectional design, involving 160 participants in the horticultural farming area in West Lampung Regency. Data analysis used Chi-square, Odds Ratio, and Logistic Regression (alpha=0.05). The results of the study found that anemia in women of childbearing age was 27.5%. The study also found three risk factors for anemia, namely poor nutritional status (OR=9,96), insufficient protein intake (OR=22,60), and insufficient intake of high-iron vegetables (OR=10,73). Nutritional interventions should emphasize increasing intake of protein, iron and vitamins, both through improving the diet, fortification and supplementation of Fe tablets.

Keyword: Anemia, women of reproductive age, farmers, protein, iron

ABSTRAK

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, wanita usia subur (WUS) dan wanita hamil. Anemia berdampak pada hilangnya produktivitas, gangguan kognitif, kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan di daerah pertanian hortikultura di Kabupaten Lampung Barat. Analisis data menggunakan Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan anemia pada wanita usia subur sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia, yaitu status gizi yang kurang baik (OR=9,96), kurang asupan protein (OR=22,60), dan kurang asupan sayuran tinggi zat besi (OR=10,73). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

Kata kunci : Anemia, wanita usia subur, petani, protein, zat besi

LATAR BELAKANG

Anemia masih menjadi masalah kesehatan masyarakat yang sangat penting di seluruh dunia, terutama di negara-negara berkembang. Anemia berkontribusi pada peningkatan morbiditas dan mortalitas, penurunan produktivitas kerja, gangguan perkembangan *neurologis*, serta risiko komplikasi kehamilan dan persalinan (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Teshale et al., 2020). Dalam jangka panjang, anemia berdampak besar terhadap kondisi kesehatan, ekonomi, dan kesejahteraan sosial (Priyanto, 2018; Teshale et al., 2020). Pada tahun 2019, anemia menyebabkan 58,6 (40,14-81,1) juta tahun hidup dengan disabilitas *(YLDs =*

Years Lived with Disability) (Gardner & Kassebaum, 2020).

Situasi anemia di Indonesia menunjukkan lebih banyak diderita pada wanita (27,2%) dibandingkan pria (20,3%), tinggal di pedesaan (25,0%) dibandingkan perkotaan (22,7%) (Kemenkes RI, 2018a). Demikian pula pada kelompok rentan, anak balita (38,5%), WUS (22,7%), dan wanita hamil (48,9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia pada ibu hamil meningkat dari 37,1% (2013) menjadi 48,9% (2018) (Kemenkes RI, 2018a). Sementara, pada kelompok WUS juga terjadi peningkatan dari 19,7% (2007) menjadi 22,7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Lebih dari separuh kasus anemia di dunia disebabkan kurangnya zat besi yang berperan dalam *erythropoiesis* dan pembentukan *hemoglobin*. Faktor gizi lain yang ikut berperan adalah kurang asupan protein, folat, vitamin-A, vitamin-B, vitamin-C, dan seng (Gardner & Kassebaum, 2020; Pasalina et al., 2019; Sahana & Sumarmi, 2015; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019). Berdasarkan SK Menteri Kesehatan RI Nomor 736a/Menkes/ XI/1989, seseorang wanita dewasa dinyatakan anemia jika kadar *hemoglobin (Hb)* dalam darah dibawah normal, yaitu kurang dari 12,0 g/dL, sedangkan pada wanita hamil kurang dari 11,0 g/dL (Kemenkes RI, 2020).

Anemia berkontribusi pada peningkatan morbiditas dan mortalitas, penurunan produktivitas kerja akibat mudah lelah, penurunan kognitif, dan gangguan perkembangan *neurologis* (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b). Pada kehamilan, anemia meningkatkan risiko pendarahan, kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi berat rendah (BBLR) dan pendek *(stunted)*, serta menjadi penyebab kematian ibu tidak langsung (Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta et al., 2020; Yushananta & Ahyanti, 2022).

Selain dipengaruhi oleh masalah gizi dan fisiologis, anemia juga dapat dipengaruhi oleh faktor lingkungan, salah satunya adalah keracunan pestisida. Keracunan pestisida menyebabkan gangguan sistem saraf (seperti sakit kepala, *paresthesia*, *tremor*, *diskoordinasi*, kejang) akibat akumulasi *asetilkolin* di saraf jaringan dan pada organ vektor. Dalam jangka panjang *(kronis)*, menyebabkan berat badan menurun, *anemia, anorexia*, dan gangguan fungsi hati (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020).

Penggunaan pestisida terbesar terutama pada pertanian, hortikultura yang menggunakan pestisida dalam dosis besar dan terus menerus selama musim tanam (Yushananta et al., 2020). Kabupaten Lampung Barat merupakan daerah pertanian hortikultura terluas di Provinsi Lampung dan sebagai sumber pendapatan terbesar daerah (53,81% PDRB). Luas lahan pertanian hortikultura mencapai 1.254 Ha dengan produksi berupa sayuran sebesar 237.500 ton (BPS, 2019). Hingga saat ini masih sedikit penelitian yang membahas anemia pada WUS yang bekerja dengan paparan pestisida. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura.

METODE

Studi *cross sectional* dilakukan di Kabupaten Lampung Barat, untuk

mengetahui faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Tiga kecamatan sebagai sentra pertanian utama hortikultura dipilih mengikuti luas daerah pertanian dan jumlah produksi pertanian hortikultura (BPS, 2019), yaitu Kecamatan Balik Bukit, Sukau dan Sekincau.

Penelitian dilakukan dari Juli hingga Agustus 2019. Wanita usia subur berusia 15-49 tahun dipilih secara *purposive*. Wanita yang sedang hamil, memiliki kelainan darah, mengkonsumsi obat yang dapat menghambat penyerapan zat besi dikeluarkan dari penelitian. Responden dinyatakan anemia, jika kadar *Hb* darah <12 gr/dL dan normal jika kadar *Hb* darah ≥ 12 gr/dL (Kemenkes RI, 2020).

Sampel dihitung berdasarkan *infinite population*, dengan prevalensi anemia pada WUS hasil penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Perhitungan jumlah sampel mengikuti formula sebagai berikut:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \,.\, P \,.\, (1-P)}{d^2}$$

dimana, n = jumlah sampel, P = proporsi atribut (0,227), d = presisi (10%), 1 - P = proporsi non atribut (0,511), $Z_{1-\alpha/2}$ = Nilai Z pada alpha 5% (1,96). Hasil perhitungan jumlah sampel minimal sebanyak 68 orang wanita usia subur. Namun, pada penelitian ini dilakukan pengambilan data terhadap 160 orang sampel. Sehingga presisi (d) meningkat menjadi 6,5%.

Data dimasukkan ke dalam SPSS (24.0) setelah diperiksa kelengkapannya, diedit, dan diberi kode. Analisis *univariate* digunakan untuk menggambarkan distribusi setiap variabel penelitian dengan frekuensi dan proporsi. Analisis *bivariate* menggunakan statistik *Chi-square* untuk mengukur variabel yang terkait dengan anemia. Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko. Untuk mengetahui hubungan antara faktor risiko dan anemia, digunakan analisis *Logistic Regression*. Perhitungan *Odds Ratio (OR)* dan *Confident Interval (CI)* 95% juga dilakukan. Semua uji statistik, p-value ≤ 0,05 dianggap signifikan.

HASIL DAN PEMBAHASAN

Hasil penelitian (Tabel 1) mendapatkan sebanyak 27,5% wanita usia subur yang bekerja pada pertanian hortikultura menderita anemia. Proporsi responden dengan status gizi baik (54,4%), sedikit lebih besar dibandingkan yang kurang baik (45,6%). Dari seluruh responden (n=160), mayoritas responden (81,9%) pernah hamil lebih dari satu kali *(multigravida),* dan (73,8%) melahirkan bayi hidup lebih dari satu kali *(multipara),* sehingga berisiko mengalami anemia.

Tabel 1 juga menggambarkan kebiasaan makan dan jenis makanan yang biasa dikonsumsi responden. Berdasarkan hasil wawancara, mayoritas responden (71,3%) telah mengkonsumsi protein dalam jumlah yang cukup. Namun, ditemukan 28,8% yang masih mengalami kekurangan. Jenis lauk sebagai sumber protein dan zat besi yang sering dikonsumsi adalah ikan, telur dan daging. Sebanyak 71,9% responden telah mengkonsumsi jenis sayuran hijau yang tinggi kandungan zat besi, antara lain daun singkong, kangkung, genjer, daun pepaya, sawi, dan daun labu. Demikian pula pada konsumsi buah, mayoritas (78,8%) telah mengkonsumsi jenis buah-buahan tinggi kandungan vitamin-C dan vitamin-A, seperti jeruk, mangga, pisang, dan pepaya.

Tabel 1
Karakteristik Responden

Variabel	Frekuensi (n)	Persen (%)
Status Anemia		
Anemia	44	27,5
Normal	116	72,5
Status Gizi		
Kurang Baik	73	45,6
Baik	87	54,4
Jumlah Kehamilan		
Berisiko	131	81,9
Baik	29	18,1
Jumlah Kelahiran		
Berisiko	118	73,8
Baik	42	26,3
Konsumsi Protein		
Kurang	46	28,8
Baik	114	71,3
Konsumsi Sayuran		
Kurang	45	28,1
Baik	115	71,9
Konsumsi Buah		
Kurang	34	21,3
Baik	126	78,8

Dari Tabel 2 terlihat bahwa pada kelompok yang menderita anemia, sebesar 42,5% memiliki status gizi yang kurang baik. Hasil analisis menunjukkan hubungan yang signifikan antara status gizi dengan kejadian anemia (p<0,05).

Berdasarkan jumlah kehamilan dan kelahiran, proporsi penderita anemia lebih besar pada kelompok yang pernah hamil lebih dari satu kali (25,2%) dan pernah melahirkan lebih dari satu kali (24,6%). Namun, hasil statistik tidak menunjukkan hubungan yang bermakna pada kedua variabel (p>0,05).

Kurang konsumsi protein menunjukkan hubungan yang signifikan (p<0,05) dengan anemia. Demikian pula pada konsumsi sayuran hijau dan buah, juga menunjukkan hubungan yang sangat signifikan dengan kejadian anemia pada WUS yang bekerja pada pertanian hortikultura (p<0,05).

Tabel 2
Uji Chi-square karakteristik responden dan anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frekuensi	(%)	Frekuensi	(%)	
Status Gizi					
Kurang Baik	31	42,5%	42	57,5%	0,000
Baik	6	6,9%	81	93,1%	
Jumlah Kehamilan					
Berisiko (> 1 kali)	33	25,2%	98	74,8%	0,283
Baik (1 kali)	4	13,8%	25	86,2%	
Jumlah Kelahiran					
Berisiko (> 1 kali)	29	24,6%	89	75,4%	0,605
Baik (1 kali)	8	19,0%	34	81,0%	
Konsumsi Protein					
Kurang	29	63,0%	17	37,0%	0,000
Baik	8	7,0%	106	93,0%	
Konsumsi Sayur					
Kurang	25	55,6%	20	44,4%	0,000
Baik	12	10,4%	103	89,6%	
Konsumsi Buah					
Kurang	16	47,1%	18	52,9%	0,000
Baik	21	16,7%	105	83,3%	

.
Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko, serta mengetahui hubungan antara faktor risiko dan anemia. Analisis dilakukan dengan *Logistic Regression* (alpha=0,05).

Tabel 3.
Uji Logistic Regresi pada faktor risiko anemia

Variables	Anemia Frekuensi (%)	Normal Frekuensi (%)	Odds Ratio (95% CI)
Status Gizi			
Kurang Baik	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)
Baik	6 (6,9%)	81 (93,1%)	1
Konsumsi Protein			
Kurang	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)
Baik	8 (7,0%)	106 (93,0%)	1
Konsumsi Sayur			
Kurang	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)
Baik	12 (10,4%)	103 (89,6%)	1

Pada analisis (Tabel 3) mendapatkan tiga faktor risiko terhadap kejadian anemia pada WUS yang bekerja di pertanian hortikultura di Kabupaten Lampung Barat, yaitu status gizi, konsumsi protein, dan konsumsi sayur. Status gizi kurang baik meningkatkan risiko anemia sebesar 9,96 kali (3,85-25,77). Kurang konsumsi protein berisiko terhadap kejadian anemia sebesar 22,60 kali (8,87-57,59). Sementara, kurang konsumsi sayur hijau menunjukkan risiko 10,73 kali (14,64-24,82).

Hasil penelitian mendapatkan prevalensi anemia pada WUS yang bekerja pada pertanian hortikultura sebesar 27,5% (Tabel 1). Hasil ini lebih besar dibandingkan beberapa laporan penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). Kondisi ini berpotensi meningkatkan morbiditas dan mortalitas, gangguan perkembangan *neurologis*, penurunan produktivitas akibat mudah kelelahan, mudah sakit, dan gangguan kognitif (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b; Teshale et al., 2020).

Anemia pada kelompok WUS juga akan meningkatkan risiko mengalami anemia pada saat kehamilan, sehingga berpotensi menimbulkan komplikasi kehamilan dan persalinan (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Komplikasi kehamilan antara lain kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi BBLR dan *stunted* (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta & Ahyanti, 2022).. Sedangkan komplikasi persalinan adalah pendarahan yang dapat menyebabkan kematian ibu (Chrispinus Siteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Anemia pada remaja dan WUS akan berlanjut pada masa kehamilan (Azwar, 2004), sehingga menjadi *independent predictor* anemia pada masa kehamilan (Demmouche et al., 2011). Masalah gizi pada kelompok umur tertentu akan mempengaruhi status gizi pada periode siklus kehidupan berikutnya *(intergenerational impact)* (Azwar, 2004; Demmouche et al., 2011). Sehingga upaya pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Penelitian telah membuktikan bahwa status gizi menjadi salah satu faktor risiko anemia (OR=9,96; 95%CI 3,85-25,77). Hasil penelitian ini konsisten dengan beberapa penelitian sebelumnya yang menyatakan bahwa status gizi berhubungan erat dengan kejadian anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway et al., 2020;

Sudikno & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Status gizi ditentukan berdasarkan penghitungan indeks massa tubuh (IMT), selanjutnya dikategorikan menjadi kurus (IMT <18,5 kg/m^2), normal (IMT 18,5-22,9 kg/m^2), gemuk (IMT 23,0-24,9 kg/m^2), obesitas I (IMT 25,0-29,9 kg/m^2), dan obesitas II (IMT ≥ 30,0 kg/m^2) (Kanazawa et al., 2005). Pada penelitian ini, kasus anemia lebih banyak ditemukan pada WUS dalam kategori kurus. Hasil penelitian ini sesuai dengan hasil penelitian sebelumnya yang menyimpulkan bahwa penderita anemia lebih banyak ditemukan pada WUS dengan kategori kurus (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Kebutuhan nutrisi dan usia berkaitan dengan kejadian anemia. Secara etiologi, bertambah usia akan diikuti dengan penurunan *progenitor eritroid* sumsum tulang, sehingga terjadi menurunkan jumlah sel darah merah yang dilepaskan ke peredaran darah. Penurunan sumsum tulang dimulai pada usia 30 tahun sebanyak 30% dan meningkat hingga 50% pada usia di atas 60 tahun (Mahlknecht & Kaiser, 2010). Tidak terpenuhinya kebutuhan gizi menyebabkan penurunan produksi sel darah merah, sehingga terjadi anemia (Demmouche et al., 2011; Mantika & Mulyati, 2014). Status gizi dan anemia memberikan gambaran malnutrisi kronik (Azwar, 2004).

Pada penelitian ditemukan bahwa konsumsi protein dan sayuran tinggi zat besi sebagai faktor risiko terjadinya anemia (Tabel 3). Kurang konsumsi protein memberikan risiko 22,60 kali (8,87-57,59), dan kurang konsumsi sayuran tinggi zat besi memberikan risiko 10,73 kali (14,64-24,82). Kekurangan asupan protein dan zat besi merupakan penyebab utama dari anemia, selain defisiensi vitamin-A, vitamin-B, vitamin-C, infeksi dan *thalassemia* (Chaparro & Suchdev, 2019). Rendahnya asupan protein, energi, dan zat besi dalam makanan merupakan faktor utama yang dapat memicu terjadinya anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Zat besi banyak terdapat pada makanan seperti daging, ikan dan unggas (*heme iron*) dan pada tumbuhan seperti sayur, buah dan biji-bijian (*nonheme iron*). Zat besi yang berasal dari *heme* lebih mudah diserap oleh tubuh dibandingkan *non heme* (Mantika & Mulyati, 2014). Defisiensi zat besi menyebabkan simpanan zat besi dalam tubuh menjadi berkurang, sehingga suplai ke sumsum tulang untuk pembentukan *hemoglobin* menjadi tidak tercukupi. Akibatnya, jumlah eritrosit *protoporfirin* bebas meningkat, sehingga terjadi produksi *eritrosit mikrositik* dan nilai *hemoglobin* menjadi turun (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Pekerjaan pada pertanian hortikultura memberikan risiko paparan pestisida dalam jumlah yang besar yang berakibat keracunan (Sulistyawati et al., 2019; Yushananta et al., 2020). Pestisida termasuk dalam kelompok bahan beracun berbahaya (B3) dan golongan *Endocrine Disrupting Chemicals (EDCs)* yaitu senyawa kimia yang dapat mengganggu *sintesis, sekresi, transpor, metabolisme*, aksi pengikatan dan penghapusan hormon alami yang berfungsi untuk menjaga *homeostasis, reproduksi* dan proses tumbuh kembang (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia menjadi salah satu dampak jangka panjang dari keracunan pestisida (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). Pembentukan senyawa *sulfhemoglobine* dan *methemoglobine* dalam darah akibat

keracunan pestisida menyebabkan penurunan kadar *hemoglobin* dalam sel darah merah yang mengakibatkan terjadinya anemia (Britt & Budinky A, 2000; George et al., 2014; G. Nutakki et al., 2017; G. S. Nutakki et al., 2016; Pinkhas & All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

Pada penelitian ini diketahui bahwa makanan sumber protein yang dikonsumsi adalah ikan, telur, dan daging. Sedangkan jenis sayuran dominan berupa sayuran hijau. Namun sekitar 28,8% dan 28,1% (Tabel 1) mengkonsumsi dalam jumlah yang tidak mencukupi. Kurangnya jumlah konsumsi, kesulitan penyerapan zat besi *non-heme,* serta paparan pestisida diduga sebagai penyebab tingginya prevalensi anemia di lokasi penelitian. Diperlukan upaya untuk meningkatkan jumlah asupan protein, zat besi, dan nutrisi mikro lainnya melalui pemilihan makanan yang baik serta perbaikan menu makanan. Penyerapan zat besi dapat tercapai secara optimal jika sajian terdiri dari kombinasi bahan pangan yang mengandung zat besi tinggi pada hewani *(heme)*, sayur-sayuran *(non-heme)*, vitamin-A, vitamin-B, dan vitamin-C (Balarajan et al., 2011; Basith et al., 2017; Bharati et al., 2008; Ghosh et al., 1980; Prihartono et al., 2011). Pemilihan makanan yang baik diharapkan dapat mencegah atau mengatasi anemia (Stephen et al., 2018). Upaya upaya *fortifikasi* dan *suplementasi* tablet *Fe* menjadi bagian yang penting untuk terus dilakukan oleh otoritas kesehatan kepada WUS. Pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

KESIMPULAN DAN SARAN

Anemia terus menjadi masalah kesehatan masyarakat yang meluas dan signifikan, sehingga harus ditangani secara memadai. Hasil penelitian mendapatkan tiga faktor risiko anemia, yaitu status gizi yang kurang baik (OR=9,96; 95%CI 3,85-25,77), kurang asupan protein (OR=22,60; 95%CI 8,87-57,59), dan kurang asupan sayuran tinggi zat besi (OR=10,73; 95%CI 14,64-24,82). Meningkatkan asupan protein dan zat besi menjadi intervensi yang harus segera dilaksanakan, baik melalui pemilihan makanan dan perbaikan menu makanan.

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Conflict of Interest

Author menyatakan tidak ada conflict of interest.

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SARAN REVIEWER

Given/First Name *)	:	Sudarmi
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Reason	:	Susbstansi artikel adalah kesehatan maternal dan gizi. Dr. Sudarmi merupakan salah satu dosen senior dengan bidang keahlian maternal, sekaligus sebagai Ketua Jurusan Kebidanan Politeknik Kesehatan Tanjungkarang dan Pengurus Ikatan Bidan Indonesia Provinsi Lampung. Beliau juga aktif dalam penelitian-penelitian bidang kesehatan masyarakat, khususnya kesehatan maternal.

Given/First Name *)	:	I
Middle Name	:	Wayan
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Reason	:	Dr. I. Wayan Juniarsana adalah salah satu dosen senior Jurusan Gizi Politeknik Kesehatan Denpasar, Bali. Beliau memiliki latar belakang pendidikan linier gizi (D3 hingga S3), dengan bidang keahlian gizi mikro dan makro.

Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

4. Pemberitahuan hasil review-2 (5 April 2021)
   - Pemberitahuan hasil review-2
   - Lampiran hasil review-2

[jika] Editor Decision

Editorial Office <jurnal.aisyah@gmail.com> 5 April 2021 pukul 09.20
Kepada: Prayudhy Yushananta <prayudhyyushananta@gmail.com>
Cc: Yetti Anggraini <yettianggraini@poltekkes-tjk.ac.id>, Mei Ahyanti <mei.ahyanti@gmail.com>, Iwan Sariyanto <sariyantoiwan@yahoo.co.id>

Dear Mr. Prayudhy Yushananta and colleague:

We have reached a decision regarding your submission to Jurnal Aisyah :
Jurnal Ilmu Kesehatan, "THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS".

Our decision is: Revisions Required

Komentar dan masukan dapat dilihat pada file yang dapat didownload pada bagian Editor Version.

Terimakasih, Salam.

Editorial Office
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FAKTOR RISIKO ANEMIA PADA WANITA USIA SUBUR DI DAERAH PERTANIAN HORTIKULTURA

THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS

ABSTRACT

Anemia continues to be an important and widespread public health problem, so it must be addressed. Around 1.74 (1.72-1.76) billion world population suffer from anemia, especially children under five, women of childbearing age (WUS) and pregnant women. Anemia has an impact on loss of productivity, cognitive impairment, susceptibility to infection, and increases the risk of complications of pregnancy and childbirth. The study was conducted with a cross-sectional design, involving 160 participants in the horticultural farming area in West Lampung Regency. Data analysis used Chi-square, Odds Ratio, and Logistic Regression (alpha=0.05). The results of the study found that anemia in women of childbearing age was 27.5%. The study also found three risk factors for anemia, namely poor nutritional status (OR=24.53), insufficient protein intake (OR=28.01), and insufficient intake of high-iron vegetables (OR=6.13). Nutritional interventions should emphasize increasing intake of protein, iron and vitamins, both through improving the diet, fortification and supplementation of Fe tablets.

Commented [A1]: Perbaiki penulisan dalam bahasa Inggris

Keyword: Anemia, women of reproductive age, farmers, protein, iron

ABSTRAK

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, wanita usia subur (WUS) dan wanita hamil. Anemia berdampak pada hilangnya produktivitas, gangguan kognitif, kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan di daerah pertanian hortikultura di Kabupaten Lampung Barat. Analisis data menggunakan Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan anemia pada wanita usia subur sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia, yaitu status gizi yang kurang baik (OR=24,53), kurang asupan protein (OR=28,01), dan kurang asupan sayuran tinggi zat besi (OR=6,13). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

Commented [A2]: 1. Tujuan penelitian belum disampaikan.
2. Metode masih belum jleas, perlu dilengkapi.
3. Apakah OR yang digunakan adalah Adjusted OR?
4. Penulisan OR harus diikuti dengan 95% CI.

Kata kunci : Anemia, wanita usia subur, petani, protein, zat besi

LATAR BELAKANG

Anemia masih menjadi masalah kesehatan masyarakat yang sangat penting di seluruh dunia, terutama di negara-negara berkembang. Anemia berkontribusi pada peningkatan morbiditas dan mortalitas, penurunan produktivitas kerja, gangguan perkembangan *neurologis,* serta risiko komplikasi kehamilan dan persalinan (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Teshale et al., 2020). Dalam jangka panjang, anemia berdampak besar terhadap kondisi kesehatan, ekonomi, dan kesejahteraan sosial (Priyanto, 2018; Teshale et al., 2020). Pada tahun 2019, anemia menyebabkan 58,6 (40,14-81,1) juta tahun hidup dengan disabilitas *(YLDs =*

Commented [A3]: 1. Author seharusnya menjelaskan secara singkat penyebab anemia.
2. Perlu dijelaskan kondisi anemia secara global dan nasional, serta kelompok berisiko.
3. Belum ada penjelasan tentang mekanisme pengaruh pestisida terhadap anemia.

Years Lived with Disability) (Gardner & Kassebaum, 2020).

Situasi anemia di Indonesia menunjukkan lebih banyak diderita pada wanita (27,2%) dibandingkan pria (20,3%), tinggal di pedesaan (25,0%) dibandingkan perkotaan (22,7%) (Kemenkes RI, 2018a). Demikian pula pada kelompok rentan, anak balita (38,5%), WUS (22,7%), dan wanita hamil (48,9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia pada ibu hamil meningkat dari 37,1% (2013) menjadi 48,9% (2018) (Kemenkes RI, 2018a). Sementara, pada kelompok WUS juga terjadi peningkatan dari 19,7% (2007) menjadi 22,7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Lebih dari separuh kasus anemia di dunia disebabkan kurangnya zat besi yang berperan dalam *erythropoiesis* dan pembentukan *hemoglobin*. Faktor gizi lain yang ikut berperan adalah kurang asupan protein, folat, vitamin-A, vitamin-B, vitamin-C, dan seng (Gardner & Kassebaum, 2020; Pasalina et al., 2019; Sahana & Sumarmi, 2015; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019). Berdasarkan SK Menteri Kesehatan RI Nomor 736a/Menkes/ XI/1989, seseorang wanita dewasa dinyatakan anemia jika kadar *hemoglobin (Hb)* dalam darah dibawah normal, yaitu kurang dari 12,0 g/dL, sedangkan pada wanita hamil kurang dari 11,0 g/dL (Kemenkes RI, 2020).

Anemia berkontribusi pada peningkatan morbiditas dan mortalitas, penurunan produktivitas kerja akibat mudah lelah, penurunan kognitif, dan gangguan perkembangan *neurologis* (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b). Pada kehamilan, anemia meningkatkan risiko pendarahan, kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi berat rendah (BBLR) dan pendek *(stunted)*, serta menjadi penyebab kematian ibu tidak langsung (Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta et al., 2020; Yushananta & Ahyanti, 2022).

Selain dipengaruhi oleh masalah gizi dan fisiologis, anemia juga dapat dipengaruhi oleh faktor lingkungan, salah satunya adalah keracunan pestisida. Keracunan pestisida menyebabkan gangguan sistem saraf (seperti sakit kepala, *paresthesia, tremor, diskoordinasi*, kejang) akibat akumulasi *asetilkolin* di saraf jaringan dan pada organ vektor. Dalam jangka panjang *(kronis)*, menyebabkan berat badan menurun, *anemia*, *anorexia*, dan gangguan fungsi hati (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020).

Penggunaan pestisida terbesar terutama pada pertanian, hortikultura yang menggunakan pestisida dalam dosis besar dan terus menerus selama musim tanam (Yushananta et al., 2020). Kabupaten Lampung Barat merupakan daerah pertanian hortikultura terluas di Provinsi Lampung dan sebagai sumber pendapatan terbesar daerah (53,81% PDRB). Luas lahan pertanian hortikultura mencapai 1.254 Ha dengan produksi berupa sayuran sebesar 237.500 ton (BPS, 2019). Hingga saat ini masih sedikit penelitian yang membahas anemia pada WUS yang bekerja dengan paparan pestisida. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura.

METODE

Studi *cross sectional* dilakukan di Kabupaten Lampung Barat, untuk

Commented [A4]: Bagaimana dengan kondisi global?

Commented [A5]: Perlu penjelasan lebih detail.

Commented [A6]: 1. Apakah penelitian telah memenuhi kelayakan etik? Jika ya, harus disebutkan.
2. Bagaimana cara pengumpulan data? Termasuk metode pengambilan dan analisis sampel biologis.

mengetahui faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Tiga kecamatan sebagai sentra pertanian utama hortikultura dipilih mengikuti luas daerah pertanian dan jumlah produksi pertanian hortikultura (BPS, 2019), yaitu Kecamatan Balik Bukit, Sukau dan Sekincau.

Penelitian dilakukan dari Juli hingga Agustus 2019. Wanita usia subur berusia 15-49 tahun dipilih secara *purposive*. Wanita yang sedang hamil, memiliki kelainan darah, mengkonsumsi obat yang dapat menghambat penyerapan zat besi dikeluarkan dari penelitian. Responden dinyatakan anemia, jika kadar *Hb* darah <12 gr/dL dan normal jika kadar *Hb* darah ≥ 12 gr/dL (Kemenkes RI, 2020).

Sampel dihitung berdasarkan *infinite population*, dengan prevalensi anemia pada WUS hasil penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Perhitungan jumlah sampel mengikuti formula sebagai berikut:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \cdot P \cdot (1-P)}{d^2}$$

dimana, n = jumlah sampel, P = proporsi atribut (0,227), d = presisi (10%), 1 - P = proporsi non atribut (0,511), $Z_{1-\alpha/2}$ = Nilai Z pada alpha 5% (1,96). Hasil perhitungan jumlah sampel minimal sebanyak 68 orang wanita usia subur. Namun, pada penelitian ini dilakukan pengambilan data terhadap 160 orang sampel. Sehingga presisi (d) meningkat menjadi 6,5%.

Data dimasukkan ke dalam SPSS (24.0) setelah diperiksa kelengkapannya, diedit, dan diberi kode. Analisis *univariate* digunakan untuk menggambarkan distribusi setiap variabel penelitian dengan frekuensi dan proporsi. Analisis *bivariate* menggunakan statistik *Chi-square* untuk mengukur variabel yang terkait dengan anemia. Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko. Untuk mengetahui hubungan antara faktor risiko dan anemia, digunakan analisis *Logistic Regression*. Perhitungan *Odds Ratio (OR)* dan *Confident Interval (CI)* 95% juga dilakukan. Semua uji statistik, p-value ≤ 0,05 dianggap signifikan.

HASIL DAN PEMBAHASAN

Hasil penelitian (Tabel 1) mendapatkan sebanyak 27,5% wanita usia subur yang bekerja pada pertanian hortikultura menderita anemia. Proporsi responden dengan status gizi baik (54,4%), sedikit lebih besar dibandingkan yang kurang baik (45,6%). Dari seluruh responden (n=160), mayoritas responden (81,9%) pernah hamil lebih dari satu kali *(multigravida)*, dan (73,8%) melahirkan bayi hidup lebih dari satu kali *(multipara)*, sehingga berisiko mengalami anemia.

Tabel 1 juga menggambarkan kebiasaan makan dan jenis makanan yang biasa dikonsumsi responden. Berdasarkan hasil wawancara, mayoritas responden (71,3%) telah mengkonsumsi protein dalam jumlah yang cukup. Namun, ditemukan 28,8% yang masih mengalami kekurangan. Jenis lauk sebagai sumber protein dan zat besi yang sering dikonsumsi adalah ikan, telur dan daging. Sebanyak 71,9% responden telah mengkonsumsi jenis sayuran hijau yang tinggi kandungan zat besi, antara lain daun singkong, kangkung, genjer, daun pepaya, sawi, dan daun labu. Demikian pula pada konsumsi buah, mayoritas (78,8%) telah mengkonsumsi jenis buah-buahan tinggi kandungan vitamin-C dan vitamin-A, seperti jeruk, mangga, pisang, dan pepaya.

Tabel 1
Karakteristik Responden

Variabel	Frekuensi (n)	Persen (%)
Status Anemia		
Anemia	44	27,5
Normal	116	72,5
Status Gizi		
Kurang Baik	73	45,6
Baik	87	54,4
Jumlah Kehamilan		
Berisiko	131	81,9
Baik	29	18,1
Jumlah Kelahiran		
Berisiko	118	73,8
Baik	42	26,3
Konsumsi Protein		
Kurang	46	28,8
Baik	114	71,3
Konsumsi Sayuran		
Kurang	45	28,1
Baik	115	71,9
Konsumsi Buah		
Kurang	34	21,3
Baik	126	78,8

Dari Tabel 2 terlihat bahwa pada kelompok yang menderita anemia, sebesar 42,5% memiliki status gizi yang kurang baik. Hasil analisis menunjukkan hubungan yang signifikan antara status gizi dengan kejadian anemia ($p<0,05$).

Berdasarkan jumlah kehamilan dan kelahiran, proporsi penderita anemia lebih besar pada kelompok yang pernah hamil lebih dari satu kali (25,2%) dan pernah melahirkan lebih dari satu kali (24,6%). Namun, hasil statistik tidak menunjukkan hubungan yang bermakna pada kedua variabel ($p>0,05$).

Kurang konsumsi protein menunjukkan hubungan yang signifikan ($p<0,05$) dengan anemia. Demikian pula pada konsumsi sayuran hijau dan buah, juga menunjukkan hubungan yang sangat signifikan dengan kejadian anemia pada WUS yang bekerja pada pertanian hortikultura ($p<0,05$).

Tabel 2
Uji Chi-square karakteristik responden dan anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frekuensi	(%)	Frekuensi	(%)	
Status Gizi					
Kurang Baik	31	42,5%	42	57,5%	0,000
Baik	6	6,9%	81	93,1%	
Jumlah Kehamilan					
Berisiko (> 1 kali)	33	25,2%	98	74,8%	0,283
Baik (1 kali)	4	13,8%	25	86,2%	
Jumlah Kelahiran					
Berisiko (> 1 kali)	29	24,6%	89	75,4%	0,605
Baik (1 kali)	8	19,0%	34	81,0%	
Konsumsi Protein					
Kurang	29	63,0%	17	37,0%	0,000
Baik	8	7,0%	106	93,0%	
Konsumsi Sayur					
Kurang	25	55,6%	20	44,4%	0,000
Baik	12	10,4%	103	89,6%	
Konsumsi Buah					
Kurang	16	47,1%	18	52,9%	0,000
Baik	21	16,7%	105	83,3%	

.
Variabel dengan nilai p <0,25 dilanjutkan ke analisis *multivariate* untuk mengidentifikasi faktor risiko, serta mengetahui hubungan antara faktor risiko dan anemia. Analisis dilakukan dengan *Logistic Regression* (alpha=0,05).

Tabel 3.
Uji Logistic Regresi pada faktor risiko anemia

Variables	Anemia Frekuensi (%)	Normal Frekuensi (%)	Odds Ratio (95% CI)
Status Gizi			
Kurang Baik	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)
Baik	6 (6,9%)	81 (93,1%)	1
Konsumsi Protein			
Kurang	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)
Baik	8 (7,0%)	106 (93,0%)	1
Konsumsi Sayur			
Kurang	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)
Baik	12 (10,4%)	103 (89,6%)	1

Pada analisis (Tabel 3) mendapatkan tiga faktor risiko terhadap kejadian anemia pada WUS yang bekerja di pertanian hortikultura di Kabupaten Lampung Barat, yaitu status gizi, konsumsi protein, dan konsumsi sayur. Status gizi kurang baik meningkatkan risiko anemia sebesar 9,96 kali (3,85-25,77). Kurang konsumsi protein berisiko terhadap kejadian anemia sebesar 22,60 kali (8,87-57,59). Sementara, kurang konsumsi sayur hijau menunjukkan risiko 10,73 kali (14,64-24,82).

Hasil penelitian mendapatkan prevalensi anemia pada WUS yang bekerja pada pertanian hortikultura sebesar 27,5% (Tabel 1). Hasil ini lebih besar dibandingkan beberapa laporan penelitian sebelumnya, sebesar 22,7% (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). Kondisi ini berpotensi meningkatkan morbiditas dan mortalitas, gangguan perkembangan *neurologis*, penurunan produktivitas akibat mudah kelelahan, mudah sakit, dan gangguan kognitif (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b; Teshale et al., 2020).

Anemia pada kelompok WUS juga akan meningkatkan risiko mengalami anemia pada saat kehamilan, sehingga berpotensi menimbulkan komplikasi kehamilan dan persalinan (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Komplikasi kehamilan antara lain kelahiran prematur, kematian bayi dalam kandungan, gangguan pertumbuhan janin sehingga melahirkan bayi BBLR dan *stunted* (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2010, 2012; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta & Ahyanti, 2022). Sedangkan komplikasi persalinan adalah pendarahan yang dapat menyebabkan kematian ibu (Chrispinus Siteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Anemia pada remaja dan WUS akan berlanjut pada masa kehamilan (Azwar, 2004), sehingga menjadi *independent predictor* anemia pada masa kehamilan (Demmouche et al., 2011). Masalah gizi pada kelompok umur tertentu akan mempengaruhi status gizi pada periode siklus kehidupan berikutnya *(intergenerational impact)* (Azwar, 2004; Demmouche et al., 2011). Sehingga upaya pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Penelitian telah membuktikan bahwa status gizi menjadi salah satu faktor risiko anemia (OR=9,96; 95%CI 3,85-25,77). Hasil penelitian ini konsisten dengan beberapa penelitian sebelumnya yang menyatakan bahwa status gizi berhubungan erat dengan kejadian anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway et al., 2020;

Commented [A7]: Gunakan Adjusted OR

Commented [A8]: Gunakan Adjusted OR

Commented [A9]: Gunakan Adjusted OR

Commented [A10]: Gunakan Adjusted OR

Commented [A11]: Bagaimana kaitan anemia dengan siklus menstruasi, sebagai faktor alami pada remaja dan WUS?

Sudikno & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Status gizi ditentukan berdasarkan penghitungan indeks massa tubuh (IMT), selanjutnya dikategorikan menjadi kurus (IMT <18,5 kg/m^2), normal (IMT 18,5-22,9 kg/m^2), gemuk (IMT 23,0-24,9 kg/m^2), obesitas I (IMT 25,0-29,9 kg/m^2), dan obesitas II (IMT ≥ 30,0 kg/m^2) (Kanazawa et al., 2005). Pada penelitian ini, kasus anemia lebih banyak ditemukan pada WUS dalam kategori kurus. Hasil penelitian ini sesuai dengan hasil penelitian sebelumnya yang menyimpulkan bahwa penderita anemia lebih banyak ditemukan pada WUS dengan kategori kurus (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Kebutuhan nutrisi dan usia berkaitan dengan kejadian anemia. Secara etiologi, bertambah usia akan diikuti dengan penurunan *progenitor eritroid* sumsum tulang, sehingga terjadi menurunkan jumlah sel darah merah yang dilepaskan ke peredaran darah. Penurunan sumsum tulang dimulai pada usia 30 tahun sebanyak 30% dan meningkat hingga 50% pada usia di atas 60 tahun (Mahlknecht & Kaiser, 2010). Tidak terpenuhinya kebutuhan gizi menyebabkan penurunan produksi sel darah merah, sehingga terjadi anemia (Demmouche et al., 2011; Mantika & Mulyati, 2014). Status gizi dan anemia memberikan gambaran malnutrisi kronik (Azwar, 2004).

Pada penelitian ditemukan bahwa konsumsi protein dan sayuran tinggi zat besi sebagai faktor risiko terjadinya anemia (Tabel 3). Kurang konsumsi protein memberikan risiko 22,60 kali (8,87-57,59), dan kurang konsumsi sayuran tinggi zat besi memberikan risiko 10,73 kali (14,64-24,82). Kekurangan asupan protein dan zat besi merupakan penyebab utama dari anemia, selain defisiensi vitamin-A, vitamin-B, vitamin-C, infeksi dan *thalassemia* (Chaparro & Suchdev, 2019). Rendahnya asupan protein, energi, dan zat besi dalam makanan merupakan faktor utama yang dapat memicu terjadinya anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Zat besi banyak terdapat pada makanan seperti daging, ikan dan unggas (*heme iron*) dan pada tumbuhan seperti sayur, buah dan biji-bijian (*nonheme iron*). Zat besi yang berasal dari *heme* lebih mudah diserap oleh tubuh dibandingkan *non heme* (Mantika & Mulyati, 2014). Defisiensi zat besi menyebabkan simpanan zat besi dalam tubuh menjadi berkurang, sehingga suplai ke sumsum tulang untuk pembentukan *hemoglobin* menjadi tidak tercukupi. Akibatnya, jumlah eritrosit *protoporfirin* bebas meningkat, sehingga terjadi produksi *eritrosit mikrositik* dan nilai *hemoglobin* menjadi turun (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Pekerjaan pada pertanian hortikultura memberikan risiko paparan pestisida dalam jumlah yang besar yang berakibat keracunan (Sulistyawati et al., 2019; Yushananta et al., 2020). Pestisida termasuk dalam kelompok bahan beracun berbahaya (B3) dan golongan *Endocrine Disrupting Chemicals (EDCs)* yaitu senyawa kimia yang dapat mengganggu *sintesis, sekresi, transpor, metabolisme*, aksi pengikatan dan penghapusan hormon alami yang berfungsi untuk menjaga *homeostasis, reproduksi* dan proses tumbuh kembang (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia menjadi salah satu dampak jangka panjang dari keracunan pestisida (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). Pembentukan senyawa *sulfhemoglobine* dan *methemoglobine* dalam darah akibat

Commented [A12]: Perlu penjelasan lebih lanjut tentang hubungan protein dan sayuran tinggi zat besi terhadap terjadinya anemia.

keracunan pestisida menyebabkan penurunan kadar *hemoglobin* dalam sel darah merah yang mengakibatkan terjadinya anemia (Britt & Budinky A, 2000; George et al., 2014; G. Nutakki et al., 2017; G. S. Nutakki et al., 2016; Pinkhas & All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

Pada penelitian ini diketahui bahwa makanan sumber protein yang dikonsumsi adalah ikan, telur, dan daging. Sedangkan jenis sayuran dominan berupa sayuran hijau. Namun sekitar 28,8% dan 28,1% (Tabel 1) mengkonsumsi dalam jumlah yang tidak mencukupi. Kurangnya jumlah konsumsi, kesulitan penyerapan zat besi *non-heme*, serta paparan pestisida diduga sebagai penyebab tingginya prevalensi anemia di lokasi penelitian. Diperlukan upaya untuk meningkatkan jumlah asupan protein, zat besi, dan nutrisi mikro lainnya melalui pemilihan makanan yang baik serta perbaikan menu makanan. Penyerapan zat besi dapat tercapai secara optimal jika sajian terdiri dari kombinasi bahan pangan yang mengandung zat besi tinggi pada hewani *(heme)*, sayur-sayuran *(non-heme)*, vitamin-A, vitamin-B, dan vitamin-C (Balarajan et al., 2011; Basith et al., 2017; Bharati et al., 2008; Ghosh et al., 1980; Prihartono et al., 2011). Pemilihan makanan yang baik diharapkan dapat mencegah atau mengatasi anemia (Stephen et al., 2018). Upaya upaya *fortifikasi* dan *suplementasi* tablet *Fe* menjadi bagian yang penting untuk terus dilakukan oleh otoritas kesehatan kepada WUS. Pengendalian anemia pada ibu hamil adalah dengan memastikan terpenuhinya kebutuhan zat besi pada masa sebelum kehamilan (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

KESIMPULAN DAN SARAN

Anemia terus menjadi masalah kesehatan masyarakat yang meluas dan signifikan, sehingga harus ditangani secara memadai. Hasil penelitian mendapatkan tiga faktor risiko anemia, yaitu status gizi yang kurang baik (OR=9,96; 95%CI 3,85-25,77), kurang asupan protein (OR=22,60; 95%CI 8,87-57,59), dan kurang asupan sayuran tinggi zat besi (OR=10,73; 95%CI 14,64-24,82). Meningkatkan asupan protein dan zat besi menjadi intervensi yang harus segera dilaksanakan, baik melalui pemilihan makanan dan perbaikan menu makanan.

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Conflict of Interest

Author menyatakan tidak ada conflict of interest.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

5. Perbaikan review-2 (10 Mei 2021)
   - Pemberitahuan pengiriman perbaikan hasil review-2
   - Manuskrip perbaikan hasil review-2

[jika] Editor Decision

Prayudhy Yushananta <prayudhyyushananta@gmail.com> 10 Mei 2021 pukul 23.03
Kepada: Editorial Office <jurnal.aisyah@gmail.com>

Assalamualaikum Wr. Wb.

Kami telah mengirimkan melalui OJS, hasil perbaikan manuskrip (#JIKA-498) dengan judul ""THE RISK FACTORS OF ANEMIA IN WOMEN REPRODUCTIVE AGE IN HORTICULTURAL AREAS"

Selain melalukan perbaikan sesuai masukan dari reviewer, kami juga mentranslate ke dalam bahasa ingeris, serta mengganti judul menjadi "ANEMIA AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN HORTICULTURE AREA"

Kami berharap, perbaikan telah dapat diterbitkan.

Terima kasih. Salam hangat dan sehat selalu..
Wassalamualaikum Wr.Wb.

[Kutipan teks disembunyikan]

ANEMIA AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN HORTICULTURE AREA

ANEMIA DAN FAKTOR YANG TERKAIT PADA WANITA USIA SUBUR DI DAERAH PERTANIAN HORTIKULTURA

ABSTRACT

Anemia continues to be an important and widespread public health problem, so it must be addressed. About 1.74 (1.72-1.76) billion people worldwide suffer from anemia, especially children under five, women of reproductive age (WRA), and pregnant women. Around 500 million WRA suffer from anemia; this will impact the loss of productivity due to decreased work capacity, cognitive impairment, susceptibility to infections, and increased risk of complications in pregnancy and childbirth. This study analyzes the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture. The study was conducted with a cross-sectional design involving 160 participants from three main centers of horticultural agriculture in West Lampung Regency. SPSS was used for Chi-square analysis, Odds Ratio, and Logistic Regression (alpha = 0.05). The results showed that the prevalence of anemia in women of reproductive age who worked in horticultural agriculture was 27.5%. The study also identified three risk factors for anemia: poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97- 112.52), and less intake of high iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Nutritional interventions should emphasize increasing protein, iron, and vitamins through improved diet, fortification efforts, and iron supplementation.

Keyword: Anemia, women of reproductive age, farmers, protein, iron

ABSTRAK

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, Wanita Usia Subur (WUS) dan wanita hamil. Sebanyak 500 juta WUS menderita anemia, ini akan berdampak pada hilangnya produktivitas karena penurunan kapasitas kerja, gangguan kognitif, dan kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-49) yang bekerja pada pertanian hortikultura. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan dari tiga sentra utama pertanian hortikultura di Kabupaten Lampung Barat. SPSS digunakan untuk analisis Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan prevalensi anemia pada wanita usia subur yang bekerja pada pertanian hortikultura sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia: status gizi yang kurang baik (AOR=24,53; 95%CI 5,59-107,70), kurang konsumsi protein (AOR=28,01; 95%CI 6,97-112,52), dan kurang konsumsi sayuran tinggi zat besi (AOR=6,13; 95%CI 1,79-21,01). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

Kata kunci: Anemia, wanita usia subur, petani, protein, zat besi

INTRODUCTION

Anemia is still a significant public health problem around the world, especially in developing countries. Anemia contributes to increased morbidity and mortality, decreased work productivity, neurological development disorders, and the risk of complications of pregnancy and childbirth (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Teshale, Tesema, Worku, Yeshaw, & Tessema, 2020). In the long

term, anemia has a significant impact on health, economic and social welfare conditions (Priyanto, 2018; Teshale et al., 2020).

In 2019, anemia caused 58.6 (40.14-81.1) million years of living with disabilities (YLDs = Years Lived with Disability) (Gardner & Kassebaum, 2020). Anemia results from an imbalance between erythrocyte loss relative to production, caused by ineffective or ineffective erythropoiesis (for example, from nutritional deficiency, inflammation, or genetic Hb disorder) and/or excessive erythrocyte loss (due to hemolysis, blood loss, or both) (Chaparro & Suchdev, 2019).

Globally, the prevalence of anemia for all ages in 2019 is 22.8% (95% CI: 22.6-23.1), or around 1.74 (1.72-1.76) billion (Gardner & Kassebaum, 2020). The regions with the highest burden are in the tropics, especially Africa, Asia, the Caribbean, and Oceania (Chaparro & Suchdev, 2019; Gardner & Kassebaum, 2020; Kassebaum et al., 2014; Priyanto, 2018). Women are consistently at greater risk of developing anemia than men (Chaparro & Suchdev, 2019; Kassebaum et al., 2014; WHO, 2012). The most vulnerable population groups are children under the age of five (toddlers), women of reproductive age (WRA), and pregnant women (Chaparro & Suchdev, 2019; Shah & Gupta, 2002). Approximately 500 million WRA (Teshale et al., 2020; WHO, 2012), and 41.8% of pregnant women suffer from anemia (Chaparro & Suchdev, 2019; WHO, 2012).

The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Ministry of Health, 2018a). Likewise, for vulnerable groups, children under five (38.5%), WRA (22.7%), and pregnant women (48.9%) (Ministry of Health RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). Meanwhile, the WRA group also saw an increase from 19.7% (2007) to 22.7% (2013) (Ministry of Health, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

More than half of anemia cases in the world are caused by an iron deficiency which plays a role in erythropoiesis and the formation of hemoglobin. Other nutritional factors that play a role are insufficient intake of protein, folate, vitamin-A, vitamin-B, vitamin-C, and zinc (Gardner & Kassebaum, 2020; Pasalina, Jurnalis, & Ariadi, 2019; Sahana & Sumarmi, 2015; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019). Based on the Decree of the Minister of Health of the Republic of Indonesia Number 736a / Menkes / XI / 1989, an adult woman is declared anemic if the hemoglobin (Hb) level in the blood is below normal, which is less than 12.0 g / dL, while in a pregnant woman it is less than 11.0 g / dL (Ministry of Health RI, 2020).

Anemia contributes to increased morbidity and mortality, decreased work productivity due to fatigue, cognitive decline, and neurological development disorders (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b). In pregnancy, anemia increases the risk of bleeding, premature birth, infant mortality in the womb, impaired fetal growth resulting in low birth weight (LBW) and stunted babies, and causes indirect maternal death (Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta, Ahyanti, & Anggraini, 2020, 2021).

Apart from being influenced by nutritional and physiological problems, anemia can also be influenced by environmental factors, including pesticide poisoning.

Pesticide poisoning causes nervous system disorders (such as headaches, paresthesias, tremors, discoordination, seizures) due to the accumulation of acetylcholine in nerve tissue and vector organs. In the long term (chronic), it causes weight loss, anemia, anorexia, and impaired liver function (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi, Naqvi, Azmi, & Aslam, 2006; Fauziyyah, Suhartono, & Astorina , 2017; Nassar, Salim, & Malhat, 2016; Neghab, Jalilian, Taheri, Tatar, & Haji Zadeh, 2018; Okvitasari & Anwar, 2017; Patil, Patil, & Govindwar, 2003; Prasetyaningsih, Arisandi, & Retnosetiawati, 2017; Yushananta et al., 2020).

In the case of pesticide poisoning, sulfhemoglobine is formed from the sulfur content in pesticides and methemoglobine due to excessive oxidation so that the ferrous compounds turn into ferries. The formation of sulfhemoglobine and methemoglobine will interfere with the function of hemoglobin in delivering oxygen (Britt & Budinky A, 2000; George, Shaikh, Thomas, & Kundavaram, 2014; GS Nutakki, Madhav Makineni, & Madhukiran, 2016; G. Nutakki, Siripurapu, Kumar, & SasiSekhar, 2017; Pinkhas & All, 1963; Shihana, Dawson, & Buckley, 2016). The most considerable use of pesticides is especially in agriculture, horticulture, which uses large doses of pesticides and continuously during the growing season (Yushananta et al., 2020).

West Lampung Regency has the largest horticultural farming area in Lampung Province and is the largest source of regional income (53.81% of GRDP). The horticultural land area reaches 1,254 hectares with 237,500 tons of vegetables (BPS, 2019). Until now, there are still few studies that discuss anemia in women who work with exposure to pesticides. This study analyzes the risk factors for anemia in women of childbearing age (15-59) who work in horticultural agriculture.

METHODS

A cross-sectional study was conducted in West Lampung Regency to determine the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture. Three sub-districts as the main horticultural agricultural centers were chosen to follow the area of agriculture and the amount of horticultural agricultural production (BPS, 2019), namely Balik Bukit, Sukau, and Sekincau Districts. The research was conducted after obtaining approval from the Health Research Ethics Committee, Tanjungkarang Health Polytechnic (No.211/EA/KEPK-TJK/VII/2019), and permission from the West Lampung District Health Office. Guided by the Helsinki protocol, participant informed consent was taken, and data handling was confidential. There is no risk of harm to participants, and all participants have the right to withdraw during the study. All study procedures were explained before the interview.

The study was conducted from July to August 2019. Women of reproductive age (15-49 years) were selected purposively. Women who were pregnant, had blood disorders, were taking drugs that inhibited iron absorption were excluded from the study. Respondents are declared anemic if the blood Hb level is <12 gr / dL and normal if the blood Hb level is ≥ 12 gr / dL (Ministry of Health RI, 2020).

The sample is calculated based on the infinite population, with the prevalence of anemia in WRA from previous studies, amounting to 22.7% (Ministry of Health, 2013, 2018a; Sudikno & Sandjaja, 2016). The sample size calculation follows the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \cdot P \cdot (1-P)}{d^2}$$

where, n = number of samples, P = attribute proportion (0.227), d = precision (10%), 1 - P = proportion of non-attribute (0.511), Z 1-α / 2 = Z value at alpha 5% (1, 96). The

results of the calculation of the minimum sample size are 68 women of reproductive age. However, in this study, data were collected from 160 samples so that the precision (d) increases to 6.5%.

Data were collected from measurements and interviews using a questionnaire. All blood samples were taken and analyzed using the Hemocue Point of Care Testing (POCT) method. WHO standard measurements measured height and weight. All respondents were asked about their diet, type, and amount of food they usually consume.

The data were entered into SPSS (24.0) after completing it was checked, edited, and coded. Univariate analysis is used to describe the distribution of each research variable with frequency and proportion—bivariate analysis used Chi-square statistics to measure variables associated with anemia. Variables with a p-value <0.25 were continued to multivariate analysis to identify risk factors. To determine the relationship between risk factors and anemia used a Logistic Regression analysis. Odds Ratio (OR) and 95% Confident Interval (CI) calculations were also performed. For all statistical tests, a p-value ≤ of 0.05 was considered significant.

RESULTS AND DISCUSSION

The results (Table 1) found that 27.5% of women of reproductive age who work in horticultural agriculture suffer from anemia. The proportion of respondents with a good nutritional status (54.4%) was slightly higher than those with poor nutrition (45.6%). Of all respondents (n = 160), the majority of respondents (81.9%) had been pregnant more than once (multigravida), and (73.8%) gave birth to live babies more than once (multiparous), so they are at risk of developing anemia.

Table 1
Characteristics of Respondents

Variable	Frequency (n)	Percent (%)
Anemia Status		
Anemia	44	27,5
Normal	116	72,5
Nutritional Status		
Not good	73	45,6
Good	87	54,4
Number of Pregnancy		
It's risky	131	81,9
Good	29	18,1
Number of Births		
It's risky	118	73,8
Good	42	26,3
Protein Consumption		
Less	46	28,8
Good	114	71,3
Vegetables Consumption		
Less	45	28,1
Good	115	71,9
Fruit Consumption		
Less	34	21,3
Good	126	78,8

Table 1 also describes the eating habits and types of food that the respondents usually consume. Based on the results of the interviews, the majority of respondents (71.3%) had consumed adequate amounts of protein. However, it was found that 28.8% were still experiencing shortages. The types of side dishes that are often consumed as a source of protein and iron are fish, eggs, and meat. 71.9% of respondents have consumed green vegetables, which are high in iron, including cassava leaves, kale, genjer, papaya leaves, mustard greens, and pumpkin leaves. Likewise, for fruit consumption, most (78.8%) had consumed fruits high in vitamin-C and vitamin-A content, such as oranges, mangoes, bananas, and papayas.

Bivariate analysis was performed to determine the relationship between each research variable and the incidence of anemia, using the Chi-square test at alpha = 0.05. From Table 2, it can be seen that in the group suffering from anemia, 42.5% had a poor nutritional status. The analysis

showed a significant relationship between nutritional status and the incidence of anemia (p <0.05).

Based on the number of pregnancies and births, the proportion of anemia sufferers was greater in the group who had been pregnant more than once (25.2%) and had given birth more than once (24.6%). However, the statistical results did not show a significant relationship between the two variables (p> 0.05).

Lack of protein consumption showed a significant association (p <0.05) with anemia. Likewise, the consumption of green vegetables and fruit also showed a very significant relationship with the incidence of anemia in women who work in horticultural agriculture (p <0.05).

Table 2
Chi-square test for respondent characteristics and anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frequency	(%)	Frequency	(%)	
Nutritional status					
Not good	31	42,5%	42	57,5%	0,000
Good	6	6,9%	81	93,1%	
Number of Pregnancy					
It's risky	33	25,2%	98	74,8%	0,283
Good	4	13,8%	25	86,2%	
Number of Births					
It's risky	29	24,6%	89	75,4%	0,605
Good	8	19,0%	34	81,0%	
Protein Consumption					
Less	29	63,0%	17	37,0%	0,000
Good	8	7,0%	106	93,0%	
Vegetables Consumption					
Less	25	55,6%	20	44,4%	0,000
Good	12	10,4%	103	89,6%	
Fruit Consumption					
Less	16	47,1%	18	52,9%	0,000
Good	21	16,7%	105	83,3%	

Variables with a p-value <0.25 were continued to multivariate analysis to identify risk factors and determine the relationship between risk factors and anemia. The analysis was performed using Logistic Regression (alpha = 0.05).

Table 3.
Logistic Regression Test on risk factors for anemia

Variables	Anemia Frequency (%)	Normal Frequency (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Nutritional status				
Not good	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)	24,53 (5,59-107,70)
Good	6 (6,9%)	81 (93,1%)	1	1
Protein Consumption				
Less	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)	28,01 (6,97-112,52)
Good	8 (7,0%)	106 (93,0%)	1	1
Vegetables Consumption				
Less	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)	6,13 (1,79-21,01)
Good	12 (10,4%)	103 (89,6%)	1	1

In the analysis (Table 3), there are three risk factors for anemia in female prostitutes who work in horticultural agriculture in West Lampung Regency, namely nutritional

status, protein consumption, and vegetable consumption. Poor nutritional status increases the risk of anemia by 24.53 times (5.59-107.70). Lack of protein consumption is the dominant risk factor for anemia, amounting to 28.01 times (6.97-112.52). Meanwhile, less consumption of green vegetables shows a risk of 6.13 times (1.79-21.01).

The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5% (Table 1). This result is greater than some previous research reports, amounting to 22.7% (Ministry of Health, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). This condition can increase morbidity and mortality, impaired neurological development, decreased productivity due to fatigue, illness, and cognitive impairment (Chaparro & Suchdev, 2019; Ministry of Health RI, 2018b; Teshale et al., 2020).

Anemia in the WRA group will also increase the risk of experiencing anemia during pregnancy so that it has the potential to cause complications of pregnancy and childbirth (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Pregnancy complications include premature birth, infant mortality in the womb, impaired fetal growth leading to low birth weight and stunted babies (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta et al., 2021). While labor complications are bleeding, that can cause maternal death (Chrispinus Siteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

The WRA group is at high risk of developing anemia, apart from toddlers and pregnant women (Chaparro & Suchdev, 2019; Chrispinus Siteti, 2014; Shah & Gupta, 2002). Physiologically, WRA is prone to anemia because they experience menstrual cycles every month so that there is an increased need for iron (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Pasalina et al., 2019; Priyanto, 2018; Sudikno & Sandjaja, 2016; WHO, 2004; Wijayanti & Fitriani, 2019). In one menstrual period, the amount of blood lost is around 20-25 cc, or the equivalent of losing iron around 12.5-15.0 mg/month or about 0.4-0.5 mg a day (Sya`Bani & Sumarmi, 2016). So it requires more iron intake to replace lost iron (Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Anemia in adolescents and WRA will continue during pregnancy (Azwar, 2004), so that it becomes an independent predictor of anemia during pregnancy (Demmouche, S, & S, 2011). Nutritional problems in certain age groups will affect nutritional status in the next life cycle period (intergenerational impact) (Azwar, 2004; Demmouche et al., 2011). So that the effort to control anemia in pregnant women is to ensure the fulfillment of iron needs before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Research has proven that nutritional status is a risk factor for anemia (AOR = 24.53; 95% CI 5.59-107.70). The results of this study are consistent with several previous studies which state that nutritional status is closely related to the incidence of anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway, Mewo, & Assa, 2020; Sudikno. & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Nutritional status was determined based on the calculation of body mass index (BMI), then categorized as thin (BMI <18.5 kg / m2), normal (BMI 18.5-22.9 kg / m2), obese (BMI 23.0-24 , 9 kg / m2), obesity I (BMI 25.0-29.9 kg / m2), and obesity II (BMI ≥ 30.0 kg / m2) (Kanazawa et al., 2005). In this study, cases of anemia were mostly found in underweight women. The

results of this study are following the results of previous studies, which concluded that anemia sufferers were more often found in WRA with the thin category (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Nutritional requirements and age are related to the incidence of anemia. In etiology, increasing age will be followed by a decrease in bone marrow erythroid progenitor, resulting in a decrease in the number of red blood cells released into the bloodstream. Bone marrow decline begins at 30 years by 30% and increases to 50% at the age above 60 years (Mahlknecht & Kaiser, 2010). Not meeting nutritional needs causes a decrease in the production of red blood cells, resulting in anemia (Demmouche et al., 2011; Mantika & Mulyati, 2014). Nutritional status and anemia provide a picture of chronic malnutrition (Azwar, 2004).

This study found that consumption of protein and vegetables high in iron was a risk factor for anemia (Table 3). Less protein consumption gives a risk of 28.01 times (6.97-112.52), and less consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the leading cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection, and thalassemia (Chaparro & Suchdev, 2019). Low protein intake, energy, and iron in food is a significant factor that can trigger anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Hemoglobin synthesis requires the availability of iron and protein in sufficient quantities as the main component of heme formation in hemoglobin (Marcia, Ketryn, Karen, & Long, 2010; Wijayanti & Fitriani, 2019). Protein is also a main component of globin which plays a role in iron transport and storage (Marcia et al., 2010; Siahaan, Siallagan, Purba, & Oppusungu, 2018; Wijayanti & Fitriani, 2019). If the body lacks protein, the transport of iron into the blood plasma will be disrupted to affect blood hemoglobin levels (Sya`Bani & Sumarmi, 2016). Research by Thomson et al., which involved a cohort of 963,676 people, concluded that the lower the protein intake, the lower the hemoglobin level in the blood (Thomson et al., 2011). Lack of protein and iron causes a decrease in the formation of red blood cells resulting in reduced red blood cells in the body and causes anemia (Cavalcanti, de Vasconcelos, Muniz, dos Santos, & Osório, 2014). The relationship between protein consumption adequacy was also presented in several other studies (Azizah & Adriani, 2018; Azwar, 2004; Barth - Jaeggi et al., 2020; Mantika & Mulyati, 2014; Setyaningsih, AP, & Nurwijayanti, 2014; Wijayanti & Fitriani, 2019).

Iron is found in meat, fish, poultry (heme iron), and plants such as vegetables, fruit, and seeds (non-heme iron). The body more readily absorbs iron derived from heme than non-heme (Mantika & Mulyati, 2014). Iron deficiency causes iron stores in the body to decrease so that the supply to the bone marrow for hemoglobin formation is insufficient. As a result, the number of free protoporphyrin erythrocytes increases, resulting in the production of microcytic erythrocytes, and the hemoglobin value decreases (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Work on horticultural agriculture poses a risk of exposure to large amounts of pesticides which result in poisoning (Sulistyawati, Margawati, Rosidi, & Suhartono, 2019; Yushananta et al., 2020). Pesticides are included in the group of hazardous toxic substances and the Endocrine Disrupting Chemicals (EDCs), namely chemical compounds that can interfere with the synthesis, secretion, transport, metabolism, binding action, and elimination of natural hormones that function to maintain homeostasis,

reproduction, and growth and development processes (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia is one of the long-term effects of pesticide poisoning (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018 ; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). The formation of sulfhemoglobine and methemoglobine compounds in the blood due to pesticide poisoning causes a decrease in hemoglobin levels in red blood cells, which results in anemia (Britt & Budinky A, 2000; George et al., 2014; GS Nutakki et al., 2016; G. Nutakki et al. ., 2017; Pinkhas & All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

In this study, it is known that the food sources of protein consumed are fish, eggs, and meat. Meanwhile, the dominant type of vegetables is green vegetables. However, 28.8% and 28.1% (Table 1) consumed insufficient amounts. Insufficient consumption, difficulty in absorbing non-heme iron, and exposure to pesticides are thought to be the causes of the high prevalence of anemia in the study sites. Efforts are needed to increase the amount of protein, iron, and other micronutrients through good food selection and improved diet. The absorption of iron can be achieved optimally if the dish consists of a combination of food ingredients that contain high iron in animals (heme), vegetables (non-heme), vitamin-A, vitamin-B, and vitamin-C (Balarajan, Ramakrishnan , Özaltin, Shankar, & Subramanian, 2011; Basith, Agustina, & Diani, 2017; Bharati, Som, Chakrabarty, Bharati, & Pal, 2008; Ghosh et al., 1980; Prihartono et al., 2011). The selection of good food is expected to prevent or overcome anemia (Stephen et al., 2018). Efforts for fortification and supplementation of Fe tablets are an essential part to be carried out by health authorities to WRA. Control of anemia in pregnant women ensures the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

CONCLUSIONS AND SUGGESTIONS

Anemia continues to be a widespread and significant public health problem, so it must be treated adequately. The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5%, higher than the previous report (22.7%). Three risk factors for anemia were found, namely poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and less intake of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Increasing protein and iron intake is an intervention that must be implemented immediately, both through food selection and food menu improvements. Give special attention to chronic anemia in the WRA group, post menarche adolescents, and the poor through fortification and supplementation of Fe tablets.

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Conflict of Interest

The author declares there is no conflict of interest.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

6. Pemberitahuan artikel accepted (31 Mei 2021)

[jika] Editor Decision

Editorial Office <jurnal.aisyah@gmail.com> 30 Mei 2021 pukul 10.30
Kepada: Prayudhy Yushananta <prayudhyyushananta@gmail.com>

Dear Mr. Prayudhy Yushananta:

We have reached a decision regarding your submission ID #JIKA-498 to the Jurnal Aisyah: Jurnal Ilmu Kesehatan, entitle "ANEMIA AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN HORTICULTURE AREA"

Hereby, we would like to inform you that your manuscript is declared accepted and is waiting for the schedule to be published in the Jurnal Aisyah: Jurnal Ilmu Kesehatan.
In this regard, please pay Article processing charges (APCs) of IDR 2,030,000 (140USDx14,500, see https://kurs.web.id/bank/bri). Payment can be transferred to Bank Rakyat Indonesia (BRI)

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Scheduling Manuscript issuance will be processed immediately after the proof of payment transfer and the completed form statement letter is sent via email.
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Thank you for your attention and cooperation.

Warmest Regard,
[Kutipan teks disembunyikan]

Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

7. Pembayaran APC (1 Juni 2021)
   - Pemberitahuan pengiriman bukti pembayaran APC dan Author statement
   - Konfirmasi penerimaan bukti pembayaran APC dan Author statement

Gmail Prayudhy Yushananta <prayudhyyushananta@gmail.com>

Schedule publish

Prayudhy Yushananta <prayudhyyushananta@gmail.com> 1 Juni 2021 pukul 11.45
Kepada: Jurnal Aisyah <jurnal.aisyah@gmail.com>

Assalamualaikum Wr.Wb
Saya kirimkan bukti bayar APC dan Author Agreement untuk manuskrip dengan judul "ANEMIA AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN HORTICULTURE AREA"

Terima kasih. Wassalamualaikum Wr. Wb
[Kutipan teks disembunyikan]

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[jika] Editor Decision

Jurnal Aisyah <jurnal.aisyah@gmail.com> 2 Juni 2021 pukul 08.45
Kepada: Prayudhy Yushananta <prayudhyyushananta@gmail.com>

Waalaikumsalamwrwb bpk. Yushananta.

Terimakasih sudah melakukan pembayaran biaya publikasi artikel.

Salam.

[Kutipan teks disembunyikan]

Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

8. LoA (2 Juni 2021)

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Manuscript Tittle : ANEMIA AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN HORTICULTURE AREA

Name of Author(s) : Prayudhy Yushananta, Yetti Anggraini, Mei Ahyanti, Iwan Sariyanto

Dear Mr Prayudhy Yushananta and colleague

Thank you very much for your submission to our journal. We are pleased to inform you that your paper (with ID number #JIKA-498) has been accepted for publication on Jurnal Aisyah: Jurnal Ilmu Kesehatan (JIKA) corresponding to Vol 6 Issue 2, June 2021. This letter is official confirmation of acceptance of your research paper.

Thank you for considering this journal as a venue for your research interests.

Yours sincerely,
Jurnal Aisyah: Jurnal Ilmu Kesehatan

Hamid Mukhlis, M.Psi.,Psikolog
Managing Editor

Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

9. Pemberitahuan Galley (15 Juni 2021)
   - Pemberitahuan galley
   - Galey manuscript

[jika] Editor Decision

Jurnal Aisyah <jurnal.aisyah@gmail.com> 15 Juni 2021 pukul 10.27
Kepada: Prayudhy Yushananta <prayudhyyushananta@gmail.com>

Bpk Yushananta Yth,
Berikut kami kirimkan naskah final artikel dengan judul "Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area" untuk dilakukan Proofread final.
Permintaan perubahan naskah (baik layout maupun konten) tidak akan dilayani setelah naskah diterbitkan.

Terimakasih, salam.
[Kutipan teks disembunyikan]

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

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A B S T R A C T

Anemia continues to be an important and widespread public health problem, so it must be addressed. About 1.74 (1.72-1.76) billion people worldwide suffer from anemia, especially children under five, Women of Reproductive Age (WRA), and pregnant women. As many as 500 million WRA suffer from anemia; this will impact the loss of productivity due to decreased work capacity, cognitive impairment, susceptibility to infections, and increased risk of complications in pregnancy and childbirth. This study analyzes the risk factors for anemia in women of reproductive age (15-59) who work in horticultural agriculture. The study was conducted with a cross-sectional design involving 160 participants from three main centers of horticultural agriculture in West Lampung Regency. SPSS was used for Chi-square analysis, Odds Ratio, and Logistic Regression (alpha = 0.05). The results showed that the prevalence of anemia in women of reproductive age who worked in horticultural agriculture was 27.5%. The study also identified three risk factors for anemia: poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112.52), and less intake of high iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Nutritional interventions should emphasize increasing protein, iron, and vitamins through improved diet, fortification efforts, and iron supplementation.

Anemia dan Faktor yang Terkait pada Wanita Usia Subur di Daerah Pertanian Hortikultura

Kata kunci:

Anemia
Wanita usia subur
Petani
Protein
Zat besi

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A B S T R A K

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, Wanita Usia Subur (WUS) dan wanita hamil. Sebanyak 500 juta WUS menderita anemia, ini akan berdampak pada hilangnya produktivitas karena penurunan kapasitas kerja, gangguan kognitif, dan kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan dari tiga sentra utama pertanian hortikultura di Kabupaten Lampung Barat. SPSS digunakan untuk analisis Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan prevalensi anemia pada wanita usia subur yang bekerja pada pertanian hortikultura sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia: status gizi yang kurang baik (AOR=24,53; 95%CI 5,59-107,70), kurang asupan protein (AOR=28,01; 95%CI 6,97-112,52), dan kurang asupan sayuran tinggi zat besi (AOR=6,13; 95%CI 1,79-21,01). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

INTRODUCTION

Anemia is still a very important public health problem around the world, especially in developing countries. Anemia contributes to increased morbidity and mortality, decreased work productivity, neurological development disorders, and the risk of complications of pregnancy and childbirth (Chaparro &Suchdev, 2019; Mantika&Mulyati, 2014; Teshale, Tesema, Worku, Yeshaw, & Tessema, 2020). In the long term, anemia has a major impact on health, economic and social welfare conditions (Priyanto, 2018; Teshale et al., 2020).

In 2019, anemia caused 58.6 (40.14-81.1) million years of living with disabilities (YLDs = Years Lived with Disability) (Gardner &Kassebaum, 2020). Anemia results from an imbalance between erythrocyte loss relative to production, caused by ineffective or ineffective erythropoiesis (for example, from nutritional deficiency, inflammation, or genetic Hb disorder) and / or excessive erythrocyte loss (due to hemolysis, blood loss, or both) (Chaparro &Suchdev, 2019).

Globally, the prevalence of anemia for all ages in 2019 is 22.8% (95% CI: 22.6-23.1), or around 1.74 (1.72-1.76) billion (Gardner &Kassebaum, 2020). The regions with the highest burden are in the tropics, especially Africa, Asia, the Caribbean and Oceania (Chaparro &Suchdev, 2019; Gardner &Kassebaum, 2020; Kassebaum et al., 2014; Priyanto, 2018). Women are consistently at greater risk of developing anemia than men (Chaparro &Suchdev, 2019; Kassebaum et al., 2014; WHO, 2012). The most vulnerable population groups are children under the age of five (toddlers), women of childbearing age, and pregnant women (Chaparro &Suchdev, 2019; Shah & Gupta, 2002). Approximately 500 million (Teshale et al., 2020; WHO, 2012), and 41.8% of pregnant women suffer from anemia (Chaparro &Suchdev, 2019; WHO, 2012).

The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Ministry of Health, 2018a). Likewise for vulnerable groups, children under five (38.5%), (22.7%), and pregnant women (48.9%) (Ministry of Health RI, 2013, 2018a; Sudikno&Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). Meanwhile, the WUS group also saw an increase from 19.7% (2007) to 22.7% (2013) (Ministry of Health, 2013; Sudikno&Sandjaja, 2016; Wijayanti&Fitriani, 2019).

More than half of anemia cases in the world are caused by a lack of iron which plays a role in erythropoiesis and the formation of hemoglobin. Other nutritional factors that play a role are insufficient intake of protein, folate, vitamin-A, vitamin-B, vitamin-C, and zinc (Gardner &Kassebaum, 2020; Pasalina, Jurnalis, &Ariadi, 2019; Sahana &Sumarmi, 2015; Sudikno&Sandjaja, 2016; Teshale et al., 2020; Widyarni&Qoriati, 2019; Wijayanti&Fitriani, 2019). Based on the Decree of the Minister of Health of the Republic of Indonesia Number 736a / Menkes / XI / 1989, an adult woman is declared anemic if the hemoglobin (Hb) level in the blood is below normal, which is less than 12.0 g / dL, while in a pregnant woman it is less than 11.0 g / dL (Ministry of Health RI, 2020).

Anemia contributes to increased morbidity and mortality, decreased work productivity due to fatigue, cognitive decline, and neurological development disorders (Chaparro &Suchdev, 2019; Kemenkes RI, 2018b). In pregnancy, anemia increases the risk of bleeding, premature birth, infant mortality in the womb, impaired fetal growth resulting in low birth weight (LBW) and stunted babies, and causes indirect maternal death (Destarina, 2018; Eskenaziet al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta, Ahyanti, &Anggraini, 2020, 2021) .

Apart from being influenced by nutritional and physiological problems, anemia can also be influenced by environmental factors, one of which is pesticide poisoning. Pesticide poisoning causes nervous system disorders (such as headaches, paresthesias, tremors, discoordination, seizures) due to the accumulation of acetylcholine in nerve tissue and in vector organs. In the long term (chronic), it causes weight loss, anemia, anorexia, and impaired liver function (Agustina &Norfai, 2018; Arwin&Suyud, 2016; Azmi, Naqvi, Azmi, & Aslam, 2006; Fauziyyah, Suhartono, &Astorina , 2017; Nassar, Salim, &Malhat, 2016; Neghab, Jalilian, Taheri, Tatar, & Haji Zadeh, 2018; Okvitasari& Anwar, 2017; Patil, Patil, &Govindwar, 2003; Prasetyaningsih, Arisandi & Retnosetiawati, 2017; Yushananta et al., 2020).

In the case of pesticide poisoning, sulfhemoglobine is formed from the sulfur content in pesticides, as well as methemoglobine due to excessive oxidation so that the ferrous compounds turn into ferries. The formation of sulfhemoglobine and methemoglobine will interfere with the function of hemoglobin in delivering oxygen (Britt &Budinky A, 2000; George, Shaikh, Thomas, &Kundavaram, 2014; GS Nutakki, Madhav Makineni, &Madhukiran, 2016; G. Nutakki, Siripurapu, Kumar, &SasiSekhar, 2017; Pinkhas& All, 1963; Shihana, Dawson, & Buckley, 2016). The largest use of pesticides is especially in agriculture, horticulture, which uses large doses of pesticides and continuously during the growing season (Yushananta et al., 2020).

West Lampung Regency has the largest horticultural farming area in Lampung Province and is the largest source of regional income (53.81% of GRDP). Horticultural land area reaches 1,254 hectares with a production of 237,500 tons of vegetables (BPS, 2019). Until now, there are still few studies that discuss anemia in female women who work with pesticide exposure. This study aims to analyze the risk factors for anemia in women of childbearing age (15-59) who work in horticultural agriculture.

METHOD

A cross sectional study was conducted in West Lampung Regency, to determine the risk factors for anemia in women of childbearing age (15-59) who work in horticultural agriculture. Three sub-districts as the main horticultural agricultural centers were chosen to follow the area of agriculture and the amount of horticultural agricultural production (BPS, 2019), namely Balik Bukit, Sukau and Sekincau Districts. The research was conducted after obtaining approval from the Health Research Ethics Committee, Tanjungkarang Health Polytechnic (No.211 / EA / KEPK-TJK / VII / 2019) and permission from the West Lampung District Health Office. Guided by the Helsinki protocol, participant informed consent was taken, and data handling was confidential. There is no risk of harm to participants, and all participants have the right to withdraw during the study. All study procedures were explained prior to the interview.

The study was conducted from July up to August 2019. Women of childbearing age aged 15-49 years were selected purposively. Women who were pregnant, had blood disorders, were taking drugs that inhibited iron absorption

were excluded from the study. Respondents are declared anemic, if the blood Hb level is <12 gr / dL and normal if the blood Hb level is ≥ 12 gr / dL (Ministry of Health RI, 2020).

The sample is calculated based on the infinite population, with the prevalence of anemia in Women of childbearing age from previous studies, amounting to 22.7% (Ministry of Health, 2013, 2018a; Sudikno&Sandjaja, 2016). The sample size calculation follows the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} . P . (1-P)}{d^2}$$

Where, n = number of samples, P = attribute proportion (0.227), d = precision (10%), 1 - P = proportion of non-attribute (0.511), Z 1-α / 2 = Z value at alpha 5% (1, 96). The results of the calculation of the minimum sample size are 68 women of childbearing age. However, in this study, data were collected from 160 samples. So that the precision (d) increases to 6.5%.

Data were collected from measurements and interviews using a questionnaire. All blood samples were taken and analyzed using the Hemocue Point of Care Testing (POCT) method. Height and weight were measured by WHO standard measurements. All respondents were asked about their diet, type and amount of food they usually consume.

The data was entered into SPSS (24.0) after completing it was checked, edited, and coded. Univariate analysis is used to describe the distribution of each research variable with frequency and proportion. Bivariate analysis used Chi-square statistics to measure variables associated with anemia. Variables with p value <0.25 were continued to multivariate analysis to identify risk factors. To determine the relationship between risk factors and anemia, a Logistic Regression analysis was used. Odds Ratio (OR) and 95% Confident Interval (CI) calculations were also performed. For all statistical tests, p-value ≤ 0.05 was considered significant.

RESULTS AND DISCUSSION

The results (Table 1) found that 27.5% of women of childbearing age who work in horticultural agriculture suffer from anemia. The proportion of respondents with good nutritional status (54.4%) was slightly higher than those with poor nutrition (45.6%). All respondents (n = 160), the majority of respondents (81.9%) had been pregnant more than once (multigravida), and (73.8%) gave birth to live babies more than once (multiparous), so they are at risk of developing anemia.

Table 1 also describes the eating habits and types of food that the respondents usually consume. Based on the results of the interviews, the majority of respondents (71.3%) had consumed adequate amounts of protein. However, it was found that 28.8% were still experiencing shortages. The types of side dishes that are often consumed as a source of protein and iron are fish, eggs and meat. As many as 71.9% of respondents have consumed types of green vegetables that are high in iron, including cassava leaves, kale, genjer*(edible riverine plant)*, papaya leaves, mustard greens, and pumpkin leaves. Likewise for fruit consumption, the majority (78.8%) had consumed fruits high in vitamin-C and vitamin-A content, such as oranges, mangoes, bananas, and papayas.

Table 1
Respondents Characteristics

Variables	Frequency (n)	Percentage (%)
Anemia's Status		
Anemia	44	27,5
Normal	116	72,5
Nutritional Status		
Dissatisfactory	73	45,6
Good	87	54,4
Total Pregnancy		
Risk	131	81,9
Good	29	18,1
Total birth		
Risk	118	73,8
Good	42	26,3
Protein Intake		
Lack	46	28,8
Good	114	71,3
Vegetable consumption		
Lack	45	28,1
Good	115	71,9
Fruit Consumption		
Lack	34	21,3
Good	126	78,8

Bivariate analysis was performed to determine the correlation between each research variable and the genesis of anemia, using the Chi-square test at alpha = 0.05. From Table 2, it can be seen that in the group suffering from anemia, 42.5% had a poor nutritional status. The analysis showed a significant relationship between nutritional status and the genesis of anemia (p <0.05).

Based on the number of pregnancies and births, the proportion of anemia sufferers was greater in the group who had been pregnant more than once (25.2%) and had given birth more than once (24.6%). However, the statistical results

did not show a significant correlation between the two variables (p> 0.05).

Lack of protein intake showed a significant correlation (p <0.05) with anemia. Likewise, the consumption of green vegetables and fruit also showed a very significant correlation with the genesis of anemia in women who work in horticultural agriculture (p <0.05).

Table 2
Chi-square test of Respondents Characteristics and Anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frequency	(%)	Frequency	(%)	
NutritionalStatus					
Dissatisfactory	31	42,5	42	57,5	0,000
Good	6	6,9	81	93,1	
Total Pregnancy					
Risk (more than once)	33	25,2	98	74,8	0,283
Good (once)	4	13,8	25	86,2	
Total Birth					
Risk (more than once)	29	24,6	89	75,4	0,605
Good (once)	8	19,0	34	81,0	
Protein Intake					
Lack	29	63,0	17	37,0	0,000
Good	8	7,0	106	93,0	
Vegetable Consumption					
Lack	25	55,6	20	44,4	0,000
Good	12	10,4	103	89,6	
Fruit Consumption					
Lack	16	47,1	18	52,9	0,000
Good	21	16,7	105	83,3	

Variables with p value <0.25 were continued to multivariate analysis to identify risk factors and determine the correlation between risk factors and anemia. The analysis was performed using Logistic Regression (alpha = 0.05).

Tabel 3.
Logistic Regression Test on the Risk Factors of Anemia

Variables	Anemia Frequency (%)	Normal Frequency (%)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
NutritionalStatus				
Dissatisfactory	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)	24,53 (5,59-107,70)
Good	6 (6,9%)	81 (93,1%)	1	1
Protein Intake				
Dissatisfactory	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)	28,01 (6,97-112,52)
Good	8 (7,0%)	106 (93,0%)	1	1
Vegetable Consumption				
Dissatisfactory	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)	6,13 (1,79-21,01)
Good	12 (10,4%)	103 (89,6%)	1	1

In the analysis (Table 3), there are three risk factors for anemia among women who work in horticultural agriculture in West Lampung Regency, namely nutritional status, protein consumption, and vegetable consumption. Poor nutritional status increases the risk of anemia by 24.53 times (5.59-107.70). Lack of protein consumption is the dominant risk factor for anemia, amounting to 28.01 times (6.97-112.52). Meanwhile, less consumption of green vegetables shows a risk of 6.13 times (1.79-21.01).

The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5% (Table 1). This result is greater than some previous research reports, amounting to 22.7% (Ministry of Health, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). This condition has the potential to increase morbidity and mortality, impaired neurological development, decreased productivity due to fatigue, illness, and cognitive impairment (Chaparro & Suchdev, 2019; Ministry of Health RI, 2018b; Teshale et al., 2020).

Anemia in the women of childbearing age group will also increase the risk of experiencing anemia during pregnancy, so that it has the potential to cause complications of pregnancy and childbirth (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Pregnancy complications include premature birth, infant mortality in the womb, impaired fetal growth leading to low birth weight and stunted babies (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta et al., 2021). While labor complications are bleeding that can cause maternal death (ChrispinusSiteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

The women of childbearing age group are one of the groups at high risk of developing anemia, apart from toddlers and pregnant women (Chaparro &Suchdev, 2019; Chrispinus

Siteti, 2014; Shah & Gupta, 2002). Physiologically, women of childbearing age are prone to anemia because they experience menstrual cycles every month so that there is an increased need for iron (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Pasalina et al., 2019; Priyanto, 2018; Sudikno & Sandjaja, 2016; WHO, 2004; Wijayanti & Fitriani, 2019). In one menstrual period, the amount of blood lost is around 20-25 cc, or the equivalent of losing iron around 12.5-15.0 mg / month or about 0.4-0.5 mg a day (Sya`Bani & Sumarmi, 2016). So it requires more iron intake to replace lost iron (Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Anemia in adolescents and women of childbearing age will continue during pregnancy (Azwar, 2004), so that it becomes an independent predictor of anemia during pregnancy (Demmouche, S, & S, 2011). Nutritional problems in certain age groups will affect nutritional status in the next life cycle period (intergenerational impact) (Azwar, 2004; Demmouche et al., 2011). So that the effort to control anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Research has proven that nutritional status is a risk factor for anemia (AOR = 24.53; 95% CI 5.59-107.70). The results of this research are consistent with several previous studies which state that nutritional status is closely related to the genesis of anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway, Mewo & Assa, 2020; Sudikno. & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Nutritional status was determined based on the calculation of body mass index (BMI), then categorized as thin (BMI <18.5 kg / m2), normal (BMI 18.5-22.9 kg / m2), obese (BMI 23.0-24 , 9 kg / m2), obesity I (BMI 25.0-29.9 kg / m2), and obesity II (BMI ≥ 30.0 kg / m2) (Kanazawa et al., 2005). In this study, cases of anemia were mostly found in women who were underweight. The results of this study are in accordance with the results of previous studies which concluded that anemia sufferers were more often found in WUS with the thin category (Sihombing&Riyadina, 2009; Sudikno&Sandjaja, 2016; Wijayanti&Fitriani, 2019).

Nutritional requirements and age are related to the genesis of anemia. In etiology, increasing age will be followed by a decrease in bone marrow erythroid progenitor, resulting in a decrease in the number of red blood cells released into the bloodstream. Bone marrow decline begins at the age of 30 years by 30% and increases to 50% at the age above 60 years (Mahlknecht & Kaiser, 2010). Not meeting nutritional needs causes a decrease in the production of red blood cells, resulting in anemia (Demmouche et al., 2011; Mantika&Mulyati, 2014). Nutritional status and anemia provide a picture of chronic malnutrition (Azwar, 2004).

In this research, it was found that consumption of protein and vegetables high in iron were a risk factor for anemia (Table 3). Less protein consumption gives a risk of 28.01 times (6.97-112.52), and less consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the main cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection and thalassemia (Chaparro & Suchdev, 2019). Low intake of protein, energy, and iron in food is a major factor that can trigger anemia (Hunt, 2003; Mantika&Mulyati, 2014).

Hemoglobin synthesis requires the availability of iron and protein in sufficient quantities as the main component of heme formation in hemoglobin (Marcia, Ketryn, Karen, & Long, 2010; Wijayanti&Fitriani, 2019). Protein is also a major component of globin which plays a role in iron transport and storage (Marcia et al., 2010; Siahaan, Siallagan, Purba, & Oppusungu, 2018; Wijayanti & Fitriani, 2019). If the body lacks protein, the transport of iron into the blood plasma will be disrupted so that it will affect blood hemoglobin levels (Sya`Bani & Sumarmi, 2016). Research by Thomson et al, which involved a cohort of 963,676 people concluded that the lower the protein intake, the lower the hemoglobin level in the blood (Thomson et al., 2011). Lack of protein and iron causes a decrease in the formation of red blood cells resulting in reduced red blood cells in the body and causes anemia (Cavalcanti, de Vasconcelos, Muniz, dos Santos, & Osório, 2014). The relationship between protein consumption adequacy was also presented in several other studies (Azizah & Adriani, 2018; Azwar, 2004; Barth-Jaeggi et al., 2020; Mantika & Mulyati, 2014; Setyaningsih, AP, &Nurwijayanti, 2014; Wijayanti & Fitriani, 2019).

Iron is found in foods such as meat, fish and poultry (heme iron) and in plants such as vegetables, fruit and seeds (nonheme iron). Iron derived from heme is more easily absorbed by the body than non-heme (Mantika & Mulyati, 2014). Iron deficiency causes iron stores in the body to decrease, so that the supply to the bone marrow for hemoglobin formation is insufficient. As a result, the number of free protoporphyrin erythrocytes increases, resulting in the production of microcytic erythrocytes and the hemoglobin value decreases (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Working on horticultural agriculture poses a risk of exposure to large amounts of pesticides which result in poisoning (Sulistyawati, Margawati, Rosidi, &Suhartono, 2019; Yushananta et al., 2020). Pesticides are included in the group of hazardous toxic substances (B3) and the Endocrine Disrupting Chemicals (EDCs), namely chemical compounds that can interfere with the synthesis, secretion, transport, metabolism, binding action and elimination of natural hormones that function to maintain homeostasis, reproduction and growth and development processes (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia is one of the long-term effects of pesticide poisoning (Agustina &Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari&Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). The formation of sulfhemoglobine and methemoglobine compounds in the blood due to pesticide poisoning causes a decrease in hemoglobin levels in red blood cells which results in anemia (Britt &Budinky A, 2000; George et al., 2014; GS Nutakki et al., 2016; G. Nutakki et al., 2017; Pinkhas& All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

In this research, it is known that the food sources of protein consumed are fish, eggs, and meat. Meanwhile, the dominant type of vegetables is green vegetables. However, 28.8% and 28.1% (Table 1) consumed insufficient amounts. Insufficient consumption, difficulty in absorbing non-heme iron, and exposure to pesticides are thought to be the causes of the high prevalence of anemia in the study sites. Efforts are needed to increase the amount of protein, iron, and other micronutrients through good food selection and improved diet. The absorption of iron can be achieved optimally if the dish consists of a combination of food ingredients that contain high iron in animals (heme), vegetables (non-heme), vitamin-A, vitamin-B, and vitamin-C (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011; Basith, Agustina, & Diani, 2017; Bharati, Som, Chakrabarty, Bharati, & Pal, 2008; Ghosh et al., 1980; Prihartono et al., 2011). Selection of good food is expected to prevent or overcome anemia (Stephen et al., 2018). Efforts for

fortification and supplementation of Fe tablets are an important part to be carried out by the health authorities to WUS. Control of anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani&Sumarmi, 2016)

CONCLUSIONS AND SUGGESTIONS

Anemia continues to be a widespread and significant public health problem, so it must be treated adequately. The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5%, higher than the previous report (22.7%). Three risk factors for anemia were found, namely poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and less intake of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Increasing protein and iron intake is an intervention that must be implemented immediately, both through food selection and food menu improvements. Give special attention to chronic anemia in the group of WUS, post menarche adolescents, and the poor through fortification and supplementation of Fe tablets.

Gratitude Note

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https://drive.google.com/drive/folders/11x5mjboq-UsiSOC2pVL0Pb1XR2GGM9o3?usp=sharing

Conflict of Interest

The author states there is no conflict of interest.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

10. Perbaikan Galey (20 Juni 2021)
    - Pemberitahuan perbaikan galley
    - Daftar koreksi
    - Penandaan koreksi
    - Hasil koreksi

[jika] Editor Decision

Prayudhy Yushananta <prayudhyyushananta@gmail.com> 20 Juni 2021 pukul 01.46
Kepada: Jurnal Aisyah <jurnal.aisyah@gmail.com>

Assalamualaikum. Wr. Wb.

Kami kirimkan daftar koreksi untuk perbaikan manuskrip.
Kami kirimkan juga manuskrip yang sudha diperbaiki (sebagai masukan), serta galey yang sudah diberi tanda (shading).
Terima kasih.

Wassalamualaikum. Wr. Wb.

[Kutipan teks disembunyikan]

3 lampiran

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DAFTAR PERBAIKAN

HALAMAN	TERTULIS	SEHARUSNYA
Abstract	poor nutritional status	dissatisfactory nutritional status
	less intake	lack consumption
	(15-59)	(15-49)
Abstrak	kurang asupan	kurang konsumsi
	(15-59)	(15-49)
INTRODUCTION		
Hal 2, Paragraf 3	women of childbearing age	women of reproductive age (WRA)
Hal 2, Paragraf 4	The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Ministry of Health, 2018a). Likewise for vulnerable groups, children under five (38.5%), (22.7%), and pregnant women (48.9%) (Ministry of Health RI, 2013, 2018a; Sudikno&Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). Meanwhile, the WUS group also saw an increase from 19.7% (2007) to 22.7% (2013) (Ministry of Health, 2013; Sudikno&Sandjaja, 2016; Wijayanti&Fitriani, 2019).	The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Kemenkes RI, 2018a). Likewise, for vulnerable groups, children under five (38.5%), WRA (22.7%), and pregnant women (48.9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). In addition, the WRA group also saw an increase from 19.7% (2007) to 22.7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019)
Hal 2, Paragraf 5	(Ministry of Health RI, 2020)	(Kemenkes RI, 2020)
Hal 2, Paragraf 9	women of childbearing age (15-59)	women of reproductive age (15-49)
METHOD		
Hal 2, Paragraf 1	women of childbearing age (15-59)	women of reproductive age (15-49)
Hal 2, Paragraf 2	women of childbearing age aged 15-49 years	women of reproductive age (15-49 years)
	(Ministry of Health RI, 2020)	(Kemenkes RI, 2020)
Hal 3, Paragraf 3	The sample is calculated based on the infinite population, with the prevalence of anemia in Women of childbearing age from previous studies, amounting to 22.7% (Ministry of Health, 2013, 2018a; Sudikno&Sandjaja, 2016). The sample size calculation follows the following formula:	The sample is calculated based on the infinite population, with the prevalence of anemia in WRA from previous studies, amounting to 22.7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). The sample size calculation follows the following formula:
Hal 3, Paragraf 4	women of childbearing age	women of reproductive age
RESULTS AND DISCUSSION		
Hal 3, Paragraf 1	women of childbearing ag	women of reproductive age
Hal 3, Table 1	Garis horizontal dalam tabel	Tidak ada garis horizontal dalam tabel
Hal 3, Paragraf 3	poor	Dissatisfactory
	genesis of anemia	prevalence of anemia
Hal 3, Paragraf 5	genesis of anemia	prevalence of anemia
Hal 4, Paragraf 7	Poor nutritional status	Dissatisfactory nutritional status
	consumption	intake
Hal 4, Paragraf 8	Ministry of Health, 2013	Kemenkes RI, 2013
	Ministry of Health RI, 2018b	Kemenkes RI, 2018b
Hal 4, Paragraf 9	Anemia in the women of childbearing age group	Anemia in the WRA group
Hal 4, Paragraf 9	The women of childbearing age group	The WRA group
Hal 5, Paragraf 10	Physiologically, women of childbearing age	Physiologically, women of reproductive age
Hal 5, Paragraf 11	Anemia in adolescents and women of childbearing age	Anemia in adolescents and WRA
Hal 5, Paragraf 12	genesis	prevalence
Hal 5, Paragraf 13	WUS	WRA
Hal 5, Paragraf 14	genesis	prevalence
Hal 5, Paragraf 15	In this research, it was found that consumption of protein and vegetables high in iron were a risk factor for anemia (Table 3). Less protein consumption	This research found that lack of protein intake and consumption of vegetables high in iron was a risk factor for anemia (Table 3). Lack protein

	gives a risk of 28.01 times (6.97-112.52), and less consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the main cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection and thalassemia (Chaparro & Suchdev, 2019). Low intake of protein, energy, and iron in food is a major factor that can trigger anemia (Hunt, 2003; Mantika&Mulyati, 2014).	intake gives a risk of 28.01 times (6.97-112.52), and lack consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the leading cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection, and thalassemia (Chaparro & Suchdev, 2019). Lack protein intake, energy, and iron in food is a significant factor that can trigger anemia (Hunt, 2003; Mantika & Mulyati, 2014).
Hal 5, Paragraf 16	The relationship between protein consumption adequacy was also presented in several other studies	The relationship between protein intake adequacy was also presented in several other studies
Hal 5, Paragraf 18	Pesticides are included in the group of hazardous toxic substances (B3) and the Endocrine Disrupting Chemicals (EDCs),	Pesticides are included in the group of chemical hazardous toxic substances and the endocrine disrupting chemicals (EDCs)
Hal 5, Paragraf 20	consumed	intake
	WUS	WRA
CONCLUSIONS AND SUGGESTIONS		
	Three risk factors for anemia were found, namely poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and less intake of high-iron vegetables (AOR= 6.13; 95% CI 1.79-21.01).	Three risk factors for anemia were found, namely dissatisfactory nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and lack consumption of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01).
	WUS	WRA
Gratitude Note	Gratitude Note	**Acknowledgement**
	https://drive.google.com/drive/folders/11x5mjboq-UsiSOC2pVL0Pb1XR2GGM9o3?usp=sharing	hilangkan
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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

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A B S T R A C T

Anemia continues to be an important and widespread public health problem, so it must be addressed. About 1.74 (1.72-1.76) billion people worldwide suffer from anemia, especially children under five, Women of Reproductive Age (WRA), and pregnant women. As many as 500 million WRA suffer from anemia; this will impact the loss of productivity due to decreased work capacity, cognitive impairment, susceptibility to infections, and increased risk of complications in pregnancy and childbirth. This study analyzes the risk factors for anemia in women of reproductive age (15-59) who work in horticultural agriculture. The study was conducted with a cross-sectional design involving 160 participants from three main centers of horticultural agriculture in West Lampung Regency. SPSS was used for Chi-square analysis, Odds Ratio, and Logistic Regression (alpha = 0.05). The results showed that the prevalence of anemia in women of reproductive age who worked in horticultural agriculture was 27.5%. The study also identified three risk factors for anemia: poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112.52), and less intake of high iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Nutritional interventions should emphasize increasing protein, iron, and vitamins through improved diet, fortification efforts, and iron supplementation.

Anemia dan Faktor yang Terkait pada Wanita Usia Subur di Daerah Pertanian Hortikultura

Kata kunci:

Anemia
Wanita usia subur
Petani
Protein
Zat besi

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A B S T R A K

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, Wanita Usia Subur (WUS) dan wanita hamil. Sebanyak 500 juta WUS menderita anemia, ini akan berdampak pada hilangnya produktivitas karena penurunan kapasitas kerja, gangguan kognitif, dan kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan dari tiga sentra utama pertanian hortikultura di Kabupaten Lampung Barat. SPSS digunakan untuk analisis Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan prevalensi anemia pada wanita usia subur yang bekerja pada pertanian hortikultura sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia: status gizi yang kurang baik (AOR=24,53; 95%CI 5,59-107,70), kurang asupan protein (AOR=28,01; 95%CI 6,97-112,52), dan kurang asupan sayuran tinggi zat besi (AOR=6,13; 95%CI 1,79-21,01). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

INTRODUCTION

Anemia is still a very important public health problem around the world, especially in developing countries. Anemia contributes to increased morbidity and mortality, decreased work productivity, neurological development disorders, and the risk of complications of pregnancy and childbirth (Chaparro &Suchdev, 2019; Mantika&Mulyati, 2014; Teshale, Tesema, Worku, Yeshaw, & Tessema, 2020). In the long term, anemia has a major impact on health, economic and social welfare conditions (Priyanto, 2018; Teshale et al., 2020).

In 2019, anemia caused 58.6 (40.14-81.1) million years of living with disabilities (YLDs = Years Lived with Disability) (Gardner &Kassebaum, 2020). Anemia results from an imbalance between erythrocyte loss relative to production, caused by ineffective or ineffective erythropoiesis (for example, from nutritional deficiency, inflammation, or genetic Hb disorder) and / or excessive erythrocyte loss (due to hemolysis, blood loss, or both) (Chaparro &Suchdev, 2019).

Globally, the prevalence of anemia for all ages in 2019 is 22.8% (95% CI: 22.6-23.1), or around 1.74 (1.72-1.76) billion (Gardner &Kassebaum, 2020). The regions with the highest burden are in the tropics, especially Africa, Asia, the Caribbean and Oceania (Chaparro &Suchdev, 2019; Gardner &Kassebaum, 2020; Kassebaum et al., 2014; Priyanto, 2018). Women are consistently at greater risk of developing anemia than men (Chaparro &Suchdev, 2019; Kassebaum et al., 2014; WHO, 2012). The most vulnerable population groups are children under the age of five (toddlers), women of childbearing age, and pregnant women (Chaparro &Suchdev, 2019; Shah & Gupta, 2002). Approximately 500 million (Teshale et al., 2020; WHO, 2012), and 41.8% of pregnant women suffer from anemia (Chaparro &Suchdev, 2019; WHO, 2012).

The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Ministry of Health, 2018a). Likewise for vulnerable groups, children under five (38.5%), (22.7%), and pregnant women (48.9%) (Ministry of Health RI, 2013, 2018a; Sudikno&Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). Meanwhile, the WUS group also saw an increase from 19.7% (2007) to 22.7% (2013) (Ministry of Health, 2013; Sudikno&Sandjaja, 2016; Wijayanti&Fitriani, 2019).

More than half of anemia cases in the world are caused by a lack of iron which plays a role in erythropoiesis and the formation of hemoglobin. Other nutritional factors that play a role are insufficient intake of protein, folate, vitamin-A, vitamin-B, vitamin-C, and zinc (Gardner &Kassebaum, 2020; Pasalina, Jurnalis, &Ariadi, 2019; Sahana &Sumarmi, 2015; Sudikno&Sandjaja, 2016; Teshale et al., 2020; Widyarni&Qoriati, 2019; Wijayanti&Fitriani, 2019). Based on the Decree of the Minister of Health of the Republic of Indonesia Number 736a / Menkes / XI / 1989, an adult woman is declared anemic if the hemoglobin (Hb) level in the blood is below normal, which is less than 12.0 g / dL, while in a pregnant woman it is less than 11.0 g / dL (Ministry of Health RI, 2020).

Anemia contributes to increased morbidity and mortality, decreased work productivity due to fatigue, cognitive decline, and neurological development disorders (Chaparro &Suchdev, 2019; Kemenkes RI, 2018b). In pregnancy, anemia increases the risk of bleeding, premature birth, infant mortality in the womb, impaired fetal growth resulting in low birth weight (LBW) and stunted babies, and causes indirect maternal death (Destarina, 2018; Eskenaziet al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta, Ahyanti, &Anggraini, 2020, 2021) .

Apart from being influenced by nutritional and physiological problems, anemia can also be influenced by environmental factors, one of which is pesticide poisoning. Pesticide poisoning causes nervous system disorders (such as headaches, paresthesias, tremors, discoordination, seizures) due to the accumulation of acetylcholine in nerve tissue and in vector organs. In the long term (chronic), it causes weight loss, anemia, anorexia, and impaired liver function (Agustina &Norfai, 2018; Arwin&Suyud, 2016; Azmi, Naqvi, Azmi, & Aslam, 2006; Fauziyyah, Suhartono, &Astorina , 2017; Nassar, Salim, &Malhat, 2016; Neghab, Jalilian, Taheri, Tatar, & Haji Zadeh, 2018; Okvitasari& Anwar, 2017; Patil, Patil, &Govindwar, 2003; Prasetyaningsih, Arisandi & Retnosetiawati, 2017; Yushananta et al., 2020).

In the case of pesticide poisoning, sulfhemoglobine is formed from the sulfur content in pesticides, as well as methemoglobine due to excessive oxidation so that the ferrous compounds turn into ferries. The formation of sulfhemoglobine and methemoglobine will interfere with the function of hemoglobin in delivering oxygen (Britt &Budinky A, 2000; George, Shaikh, Thomas, &Kundavaram, 2014; GS Nutakki, Madhav Makineni, &Madhukiran, 2016; G. Nutakki, Siripurapu, Kumar, &SasiSekhar, 2017; Pinkhas& All, 1963; Shihana, Dawson, & Buckley, 2016). The largest use of pesticides is especially in agriculture, horticulture, which uses large doses of pesticides and continuously during the growing season (Yushananta et al., 2020).

West Lampung Regency has the largest horticultural farming area in Lampung Province and is the largest source of regional income (53.81% of GRDP). Horticultural land area reaches 1,254 hectares with a production of 237,500 tons of vegetables (BPS, 2019). Until now, there are still few studies that discuss anemia in female women who work with pesticide exposure. This study aims to analyze the risk factors for anemia in women of childbearing age (15-59) who work in horticultural agriculture.

METHOD

A cross sectional study was conducted in West Lampung Regency, to determine the risk factors for anemia in women of childbearing age (15-59) who work in horticultural agriculture. Three sub-districts as the main horticultural agricultural centers were chosen to follow the area of agriculture and the amount of horticultural agricultural production (BPS, 2019), namely Balik Bukit, Sukau and Sekincau Districts. The research was conducted after obtaining approval from the Health Research Ethics Committee, Tanjungkarang Health Polytechnic (No.211 / EA / KEPK-TJK / VII / 2019) and permission from the West Lampung District Health Office. Guided by the Helsinki protocol, participant informed consent was taken, and data handling was confidential. There is no risk of harm to participants, and all participants have the right to withdraw during the study. All study procedures were explained prior to the interview.

The study was conducted from July up to August 2019. Women of childbearing age aged 15-49 years were selected purposively. Women who were pregnant, had blood disorders, were taking drugs that inhibited iron absorption

were excluded from the study. Respondents are declared anemic, if the blood Hb level is <12 gr / dL and normal if the blood Hb level is ≥ 12 gr / dL (Ministry of Health RI, 2020).

The sample is calculated based on the infinite population, with the prevalence of anemia in Women of childbearing age from previous studies, amounting to 22.7% (Ministry of Health, 2013, 2018a; Sudikno&Sandjaja, 2016). The sample size calculation follows the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} . P . (1-P)}{d^2}$$

Where, n = number of samples, P = attribute proportion (0.227), d = precision (10%), 1 - P = proportion of non-attribute (0.511), Z 1-α / 2 = Z value at alpha 5% (1, 96). The results of the calculation of the minimum sample size are 68 women of childbearing age. However, in this study, data were collected from 160 samples. So that the precision (d) increases to 6.5%.

Data were collected from measurements and interviews using a questionnaire. All blood samples were taken and analyzed using the Hemocue Point of Care Testing (POCT) method. Height and weight were measured by WHO standard measurements. All respondents were asked about their diet, type and amount of food they usually consume.

The data was entered into SPSS (24.0) after completing it was checked, edited, and coded. Univariate analysis is used to describe the distribution of each research variable with frequency and proportion. Bivariate analysis used Chi-square statistics to measure variables associated with anemia. Variables with p value <0.25 were continued to multivariate analysis to identify risk factors. To determine the relationship between risk factors and anemia, a Logistic Regression analysis was used. Odds Ratio (OR) and 95% Confident Interval (CI) calculations were also performed. For all statistical tests, p-value ≤ 0.05 was considered significant.

RESULTS AND DISCUSSION

The results (Table 1) found that 27.5% of women of childbearing age who work in horticultural agriculture suffer from anemia. The proportion of respondents with good nutritional status (54.4%) was slightly higher than those with poor nutrition (45.6%). All respondents (n = 160), the majority of respondents (81.9%) had been pregnant more than once (multigravida), and (73.8%) gave birth to live babies more than once (multiparous), so they are at risk of developing anemia.

Table 1 also describes the eating habits and types of food that the respondents usually consume. Based on the results of the interviews, the majority of respondents (71.3%) had consumed adequate amounts of protein. However, it was found that 28.8% were still experiencing shortages. The types of side dishes that are often consumed as a source of protein and iron are fish, eggs and meat. As many as 71.9% of respondents have consumed types of green vegetables that are high in iron, including cassava leaves, kale, genjer*(edible riverine plant)*, papaya leaves, mustard greens, and pumpkin leaves. Likewise for fruit consumption, the majority (78.8%) had consumed fruits high in vitamin-C and vitamin-A content, such as oranges, mangoes, bananas, and papayas.

Table 1
Respondents Characteristics

Variables	Frequency (n)	Percentage (%)
Anemia's Status		
Anemia	44	27,5
Normal	116	72,5
Nutritional Status		
Dissatisfactory	73	45,6
Good	87	54,4
Total Pregnancy		
Risk	131	81,9
Good	29	18,1
Total birth		
Risk	118	73,8
Good	42	26,3
Protein Intake		
Lack	46	28,8
Good	114	71,3
Vegetable consumption		
Lack	45	28,1
Good	115	71,9
Fruit Consumption		
Lack	34	21,3
Good	126	78,8

Bivariate analysis was performed to determine the correlation between each research variable and the genesis of anemia, using the Chi-square test at alpha = 0.05. From Table 2, it can be seen that in the group suffering from anemia, 42.5% had a poor nutritional status. The analysis showed a significant relationship between nutritional status and the genesis of anemia (p <0.05).

Based on the number of pregnancies and births, the proportion of anemia sufferers was greater in the group who had been pregnant more than once (25.2%) and had given birth more than once (24.6%). However, the statistical results

did not show a significant correlation between the two variables (p> 0.05).

Lack of protein intake showed a significant correlation (p <0.05) with anemia. Likewise, the consumption of green vegetables and fruit also showed a very significant correlation with the genesis of anemia in women who work in horticultural agriculture (p <0.05).

Table 2
Chi-square test of Respondents Characteristics and Anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frequency	(%)	Frequency	(%)	
NutritionalStatus					
Dissatisfactory	31	42,5	42	57,5	0,000
Good	6	6,9	81	93,1	
Total Pregnancy					
Risk (more than once)	33	25,2	98	74,8	0,283
Good (once)	4	13,8	25	86,2	
Total Birth					
Risk (more than once)	29	24,6	89	75,4	0,605
Good (once)	8	19,0	34	81,0	
Protein Intake					
Lack	29	63,0	17	37,0	0,000
Good	8	7,0	106	93,0	
Vegetable Consumption					
Lack	25	55,6	20	44,4	0,000
Good	12	10,4	103	89,6	
Fruit Consumption					
Lack	16	47,1	18	52,9	0,000
Good	21	16,7	105	83,3	

Variables with p value <0.25 were continued to multivariate analysis to identify risk factors and determine the correlation between risk factors and anemia. The analysis was performed using Logistic Regression (alpha = 0.05).

Tabel 3.
Logistic Regression Test on the Risk Factors of Anemia

Variables	Anemia Frequency (%)	Normal Frequency (%)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
NutritionalStatus				
Dissatisfactory	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)	24,53 (5,59-107,70)
Good	6 (6,9%)	81 (93,1%)	1	1
Protein Intake				
Dissatisfactory	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)	28,01 (6,97-112,52)
Good	8 (7,0%)	106 (93,0%)	1	1
Vegetable Consumption				
Dissatisfactory	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)	6,13 (1,79-21,01)
Good	12 (10,4%)	103 (89,6%)	1	1

In the analysis (Table 3), there are three risk factors for anemia among women who work in horticultural agriculture in West Lampung Regency, namely nutritional status, protein consumption, and vegetable consumption. Poor nutritional status increases the risk of anemia by 24.53 times (5.59-107.70). Lack of protein consumption is the dominant risk factor for anemia, amounting to 28.01 times (6.97-112.52). Meanwhile, less consumption of green vegetables shows a risk of 6.13 times (1.79-21.01).

The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5% (Table 1). This result is greater than some previous research reports, amounting to 22.7% (Ministry of Health, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). This condition has the potential to increase morbidity and mortality, impaired neurological development, decreased productivity due to fatigue, illness, and cognitive impairment (Chaparro & Suchdev, 2019; Ministry of Health RI, 2018b; Teshale et al., 2020).

Anemia in the women of childbearing age group will also increase the risk of experiencing anemia during pregnancy, so that it has the potential to cause complications of pregnancy and childbirth (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Pregnancy complications include premature birth, infant mortality in the womb, impaired fetal growth leading to low birth weight and stunted babies (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta et al., 2021). While labor complications are bleeding that can cause maternal death (ChrispinusSiteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

The women of childbearing age group are one of the groups at high risk of developing anemia, apart from toddlers and pregnant women (Chaparro &Suchdev, 2019; Chrispinus

Siteti, 2014; Shah & Gupta, 2002). Physiologically, women of childbearing age are prone to anemia because they experience menstrual cycles every month so that there is an increased need for iron (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Pasalina et al., 2019; Priyanto, 2018; Sudikno & Sandjaja, 2016; WHO, 2004; Wijayanti & Fitriani, 2019). In one menstrual period, the amount of blood lost is around 20-25 cc, or the equivalent of losing iron around 12.5-15.0 mg / month or about 0.4-0.5 mg a day (Sya`Bani & Sumarmi, 2016). So it requires more iron intake to replace lost iron (Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Anemia in adolescents and women of childbearing age will continue during pregnancy (Azwar, 2004), so that it becomes an independent predictor of anemia during pregnancy (Demmouche, S, & S, 2011). Nutritional problems in certain age groups will affect nutritional status in the next life cycle period (intergenerational impact) (Azwar, 2004; Demmouche et al., 2011). So that the effort to control anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Research has proven that nutritional status is a risk factor for anemia (AOR = 24.53; 95% CI 5.59-107.70). The results of this research are consistent with several previous studies which state that nutritional status is closely related to the genesis of anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway, Mewo & Assa, 2020; Sudikno. & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Nutritional status was determined based on the calculation of body mass index (BMI), then categorized as thin (BMI <18.5 kg / m2), normal (BMI 18.5-22.9 kg / m2), obese (BMI 23.0-24 , 9 kg / m2), obesity I (BMI 25.0-29.9 kg / m2), and obesity II (BMI ≥ 30.0 kg / m2) (Kanazawa et al., 2005). In this study, cases of anemia were mostly found in women who were underweight. The results of this study are in accordance with the results of previous studies which concluded that anemia sufferers were more often found in WUS with the thin category (Sihombing&Riyadina, 2009; Sudikno&Sandjaja, 2016; Wijayanti&Fitriani, 2019).

Nutritional requirements and age are related to the genesis of anemia. In etiology, increasing age will be followed by a decrease in bone marrow erythroid progenitor, resulting in a decrease in the number of red blood cells released into the bloodstream. Bone marrow decline begins at the age of 30 years by 30% and increases to 50% at the age above 60 years (Mahlknecht & Kaiser, 2010). Not meeting nutritional needs causes a decrease in the production of red blood cells, resulting in anemia (Demmouche et al., 2011; Mantika&Mulyati, 2014). Nutritional status and anemia provide a picture of chronic malnutrition (Azwar, 2004).

In this research, it was found that consumption of protein and vegetables high in iron were a risk factor for anemia (Table 3). Less protein consumption gives a risk of 28.01 times (6.97-112.52), and less consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the main cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection and thalassemia (Chaparro & Suchdev, 2019). Low intake of protein, energy, and iron in food is a major factor that can trigger anemia (Hunt, 2003; Mantika&Mulyati, 2014).

Hemoglobin synthesis requires the availability of iron and protein in sufficient quantities as the main component of heme formation in hemoglobin (Marcia, Ketryn, Karen, & Long, 2010; Wijayanti&Fitriani, 2019). Protein is also a major component of globin which plays a role in iron transport and storage (Marcia et al., 2010; Siahaan, Siallagan, Purba, & Oppusungu, 2018; Wijayanti & Fitriani, 2019). If the body lacks protein, the transport of iron into the blood plasma will be disrupted so that it will affect blood hemoglobin levels (Sya`Bani & Sumarmi, 2016). Research by Thomson et al, which involved a cohort of 963,676 people concluded that the lower the protein intake, the lower the hemoglobin level in the blood (Thomson et al., 2011). Lack of protein and iron causes a decrease in the formation of red blood cells resulting in reduced red blood cells in the body and causes anemia (Cavalcanti, de Vasconcelos, Muniz, dos Santos, & Osório, 2014). The relationship between protein consumption adequacy was also presented in several other studies (Azizah & Adriani, 2018; Azwar, 2004; Barth-Jaeggi et al., 2020; Mantika & Mulyati, 2014; Setyaningsih, AP, &Nurwijayanti, 2014; Wijayanti & Fitriani, 2019).

Iron is found in foods such as meat, fish and poultry (heme iron) and in plants such as vegetables, fruit and seeds (nonheme iron). Iron derived from heme is more easily absorbed by the body than non-heme (Mantika & Mulyati, 2014). Iron deficiency causes iron stores in the body to decrease, so that the supply to the bone marrow for hemoglobin formation is insufficient. As a result, the number of free protoporphyrin erythrocytes increases, resulting in the production of microcytic erythrocytes and the hemoglobin value decreases (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Working on horticultural agriculture poses a risk of exposure to large amounts of pesticides which result in poisoning (Sulistyawati, Margawati, Rosidi, &Suhartono, 2019; Yushananta et al., 2020). Pesticides are included in the group of hazardous toxic substances (B3) and the Endocrine Disrupting Chemicals (EDCs), namely chemical compounds that can interfere with the synthesis, secretion, transport, metabolism, binding action and elimination of natural hormones that function to maintain homeostasis, reproduction and growth and development processes (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia is one of the long-term effects of pesticide poisoning (Agustina &Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari&Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). The formation of sulfhemoglobine and methemoglobine compounds in the blood due to pesticide poisoning causes a decrease in hemoglobin levels in red blood cells which results in anemia (Britt &Budinky A, 2000; George et al., 2014; GS Nutakki et al., 2016; G. Nutakki et al., 2017; Pinkhas& All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

In this research, it is known that the food sources of protein consumed are fish, eggs, and meat. Meanwhile, the dominant type of vegetables is green vegetables. However, 28.8% and 28.1% (Table 1) consumed insufficient amounts. Insufficient consumption, difficulty in absorbing non-heme iron, and exposure to pesticides are thought to be the causes of the high prevalence of anemia in the study sites. Efforts are needed to increase the amount of protein, iron, and other micronutrients through good food selection and improved diet. The absorption of iron can be achieved optimally if the dish consists of a combination of food ingredients that contain high iron in animals (heme), vegetables (non-heme), vitamin-A, vitamin-B, and vitamin-C (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011; Basith, Agustina, & Diani, 2017; Bharati, Som, Chakrabarty, Bharati, & Pal, 2008; Ghosh et al., 1980; Prihartono et al., 2011). Selection of good food is expected to prevent or overcome anemia (Stephen et al., 2018). Efforts for

fortification and supplementation of Fe tablets are an important part to be carried out by the health authorities to WUS. Control of anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani&Sumarmi, 2016)

CONCLUSIONS AND SUGGESTIONS

Anemia continues to be a widespread and significant public health problem, so it must be treated adequately. The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5%, higher than the previous report (22.7%). Three risk factors for anemia were found, namely poor nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and less intake of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Increasing protein and iron intake is an intervention that must be implemented immediately, both through food selection and food menu improvements. Give special attention to chronic anemia in the group of WUS, post menarche adolescents, and the poor through fortification and supplementation of Fe tablets.

Gratitude Note

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https://drive.google.com/drive/folders/11x5mjboq-UsiSOC2pVL0Pb1XR2GGM9o3?usp=sharing

Conflict of Interest

The author states there is no conflict of interest.

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Anemia and its Associated Factors Among Women Of Reproductive Age In Horticulture Area

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Anemia continues to be an important and widespread public health problem, so it must be addressed. About 1.74 (1.72-1.76) billion people worldwide suffer from anemia, especially children under five, women of reproductive age (WRA), and pregnant women. Around 500 million WRA suffer from anemia; this will impact the loss of productivity due to decreased work capacity, cognitive impairment, susceptibility to infections, and increased risk of complications in pregnancy and childbirth. This study analyzes the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture. The study was conducted with a cross-sectional design involving 160 participants from three main centers of horticultural agriculture in West Lampung Regency. SPSS was used for Chi-square analysis, Odds Ratio, and Logistic Regression (alpha = 0.05). The results showed that the prevalence of anemia in women of reproductive age who worked in horticultural agriculture was 27.5%. The study also identified three risk factors for anemia: dissatisfactory nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97- 112.52), and lack consumption of high iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Nutritional interventions should emphasize increasing protein, iron, and vitamins through improved diet, fortification efforts, and iron supplementation.

Kata kunci:

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Wanita usia subur
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Anemia dan Faktor yang Terkait pada Wanita Usia Subur di Daerah Pertanian Hortikultura

A B S T R A K

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, wanita usia subur (WUS) dan wanita hamil. Sebanyak 500 juta WUS menderita anemia, ini akan berdampak pada hilangnya produktivitas karena penurunan kapasitas kerja, gangguan kognitif, dan kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-49) yang bekerja pada pertanian hortikultura. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan dari tiga sentra utama pertanian hortikultura di Kabupaten Lampung Barat. SPSS digunakan untuk analisis Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan prevalensi anemia pada wanita usia subur yang bekerja pada pertanian hortikultura sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia: status gizi yang kurang baik (AOR=24,53; 95%CI 5,59-107,70), kurang asupan protein (AOR=28,01; 95%CI 6,97-112,52), dan kurang konsumsi sayuran tinggi zat besi (AOR=6,13; 95%CI 1,79-21,01). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

INTRODUCTION

Anemia is still a significant public health problem around the world, especially in developing countries. Anemia contributes to increased morbidity and mortality, decreased work productivity, neurological development disorders, and the risk of complications of pregnancy and childbirth (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Teshale, Tesema, Worku, Yeshaw, & Tessema, 2020). In the long term, anemia has a significant impact on health, economic and social welfare conditions (Priyanto, 2018; Teshale et al., 2020).

In 2019, anemia caused 58.6 (40.14-81.1) million years of living with disabilities (YLDs = Years Lived with Disability) (Gardner & Kassebaum, 2020). Anemia results from an imbalance between erythrocyte loss relative to production, caused by ineffective or ineffective erythropoiesis (for example, from nutritional deficiency, inflammation, or genetic Hb disorder) and/or excessive erythrocyte loss (due to hemolysis, blood loss, or both) (Chaparro & Suchdev, 2019).

Globally, the prevalence of anemia for all ages in 2019 is 22.8% (95% CI: 22.6-23.1), or around 1.74 (1.72-1.76) billion (Gardner & Kassebaum, 2020). The regions with the highest burden are in the tropics, especially Africa, Asia, the Caribbean, and Oceania (Chaparro & Suchdev, 2019; Gardner & Kassebaum, 2020; Kassebaum et al., 2014; Priyanto, 2018). Women are consistently at greater risk of developing anemia than men (Chaparro & Suchdev, 2019; Kassebaum et al., 2014; WHO, 2012). The most vulnerable population groups are children under the age of five (toddlers), women of reproductive age (WRA), and pregnant women (Chaparro & Suchdev, 2019; Shah & Gupta, 2002). Approximately 500 million WRA (Teshale et al., 2020; WHO, 2012), and 41.8% of pregnant women suffer from anemia (Chaparro & Suchdev, 2019; WHO, 2012).

The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Kemenkes RI, 2018a). Likewise, for vulnerable groups, children under five (38.5%), WRA (22.7%), and pregnant women (48.9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). In addition, the WRA group also saw an increase from 19.7% (2007) to 22.7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019)

More than half of anemia cases in the world are caused by an iron deficiency which plays a role in erythropoiesis and the formation of hemoglobin. Other nutritional factors that play a role are insufficient intake of protein, folate, vitamin-A, vitamin-B, vitamin-C, and zinc (Gardner & Kassebaum, 2020; Pasalina, Jurnalis, & Ariadi, 2019; Sahana & Sumarmi, 2015; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019). Based on the Decree of the Minister of Health of the Republic of Indonesia Number 736a / Menkes / XI / 1989, an adult woman is declared anemic if the hemoglobin (Hb) level in the blood is below normal, which is less than 12.0 g / dL, while in a pregnant woman it is less than 11.0 g / dL (Kemenkes RI, 2020).

Anemia contributes to increased morbidity and mortality, decreased work productivity due to fatigue, cognitive decline, and neurological development disorders (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b). In pregnancy, anemia increases the risk of bleeding, premature birth, infant mortality in the womb, impaired fetal growth resulting in low birth weight (LBW) and stunted babies, and causes indirect maternal death (Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta, Ahyanti, & Anggraini, 2020, 2021).

Apart from being influenced by nutritional and physiological problems, anemia can also be influenced by environmental factors, including pesticide poisoning. Pesticide poisoning causes nervous system disorders (such as headaches, paresthesias, tremors, discoordination, seizures) due to the accumulation of acetylcholine in nerve tissue and vector organs. In the long term (chronic), it causes weight loss, anemia, anorexia, and impaired liver function (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi, Naqvi, Azmi, & Aslam, 2006; Fauziyyah, Suhartono, & Astorina, 2017; Nassar, Salim, & Malhat, 2016; Neghab, Jalilian, Taheri, Tatar, & Haji Zadeh, 2018; Okvitasari & Anwar, 2017; Patil, Patil, & Govindwar, 2003; Prasetyaningsih, Arisandi, & Retnosetiawati, 2017; Yushananta et al., 2020).

In the case of pesticide poisoning, sulfhemoglobine is formed from the sulfur content in pesticides and methemoglobine due to excessive oxidation so that the ferrous compounds turn into ferries. The formation of sulfhemoglobine and methemoglobine will interfere with the function of hemoglobin in delivering oxygen (Britt & Budinky A, 2000; George, Shaikh, Thomas, & Kundavaram, 2014; G. S. Nutakki, Madhav Makineni, & Madhukiran, 2016; G. Nutakki, Siripurapu, Kumar, & SasiSekhar, 2017; Pinkhas & All, 1963; Shihana, Dawson, & Buckley, 2016). The most considerable use of pesticides is especially in agriculture, horticulture, which uses large doses of pesticides and continuously during the growing season (Yushananta et al., 2020).

West Lampung Regency has the largest horticultural farming area in Lampung Province and is the largest source of regional income (53.81% of GRDP). The horticultural land area reaches 1,254 hectares with 237,500 tons of vegetables (BPS, 2019). Until now, there are still few studies that discuss anemia in women who work with exposure to pesticides. This study analyzes the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture.

METHODS

A cross-sectional study was conducted in West Lampung Regency to determine the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture. Three sub-districts as the main horticultural agricultural centers were chosen to follow the area of agriculture and the amount of horticultural agricultural production (BPS, 2019), namely Balik Bukit, Sukau, and Sekincau Districts. The research was conducted after obtaining approval from the Health Research Ethics Committee, Tanjungkarang Health Polytechnic (No.211/EA/KEPK-TJK/VII/2019), and permission from the West Lampung District Health Office. Guided by the Helsinki protocol, participant informed consent was taken, and data handling was confidential. There is no risk of harm to participants, and all participants have the right to withdraw during the study. All study procedures were explained before the interview.

The study was conducted from July to August 2019. Women of reproductive age (15-49 years) were selected purposively. Women who were pregnant, had blood disorders, were taking drugs that inhibited iron absorption were excluded from the study. Respondents are declared anemic if the blood Hb level is <12 gr / dL and normal if the blood Hb level is ≥ 12 gr / dL (Kemenkes RI, 2020).

The sample is calculated based on the infinite population, with the prevalence of anemia in WRA from previous studies, amounting to 22.7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). The sample size calculation follows the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \cdot P \cdot (1-P)}{d^2}$$

where, n = number of samples, P = attribute proportion (0.227), d = precision (10%), 1 - P = proportion of non-attribute (0.511), Z 1-α / 2 = Z value at alpha 5% (1, 96). The results of the calculation of the minimum sample size are 68 women of reproductive age. However, in this study, data were collected from 160 samples so that the precision (d) increases to 6.5%.

Data were collected from measurements and interviews using a questionnaire. All blood samples were taken and analyzed using the Hemocue Point of Care Testing (POCT) method. WHO standard measurements measured height and weight. All respondents were asked about their diet, type, and amount of food they usually consume.

The data were entered into SPSS (24.0) after completing it was checked, edited, and coded. Univariate analysis is used to describe the distribution of each research variable with frequency and proportion—bivariate analysis used Chi-square statistics to measure variables associated with anemia. Variables with a p-value <0.25 were continued to multivariate analysis to identify risk factors. To determine the relationship between risk factors and anemia used a Logistic Regression analysis. Odds Ratio (OR) and 95% Confident Interval (CI) calculations were also performed. For all statistical tests, a p-value ≤ of 0.05 was considered significant.

RESULTS AND DISCUSSION

The results (Table 1) found that 27.5% of women of reproductive age who work in horticultural agriculture suffer from anemia. The proportion of respondents with a good nutritional status (54.4%) was slightly higher than those with poor nutrition (45.6%). Of all respondents (n = 160), the majority of respondents (81.9%) had been pregnant more than once (multigravida), and (73.8%) gave birth to live babies more than once (multiparous), so they are at risk of developing anemia.

Table 1 also describes the eating habits and types of food that the respondents usually consume. Based on the results of the interviews, the majority of respondents (71.3%) had consumed adequate amounts of protein. However, it was found that 28.8% were still experiencing shortages. The types of side dishes that are often consumed as a source of protein and iron are fish, eggs, and meat. 71.9% of respondents have consumed green vegetables, which are high in iron, including cassava leaves, kale, genjer, papaya leaves, mustard greens, and pumpkin leaves. Likewise, for fruit consumption, most (78.8%) had consumed fruits high in vitamin-C and vitamin-A content, such as oranges, mangoes, bananas, and papayas.

Table 1
Characteristics of Respondents

Variable	Frequency (n)	Percent (%)
Anemia's Status		
Anemia	44	27,5
Normal	116	72,5
Nutritional Status		
Dissatisfactory	73	45,6
Good	87	54,4
Total Pregnancy		
Risk (more than once)	131	81,9
Good (once)	29	18,1
Total Births		
Risk (more than once)	118	73,8
Good (once)	42	26,3
Protein Intake		
Lack	46	28,8
Good	114	71,3
Vegetables Consumption		
Lack	45	28,1
Good	115	71,9
Fruit Consumption		
Lack	34	21,3
Good	126	78,8

Bivariate analysis was performed to determine the correlation between each research variable and the incidence of anemia, using the Chi-square test at alpha = 0.05. From Table 2, it can be seen that in the group suffering from anemia, 42.5% had a poor nutritional status. The analysis showed a significant relationship between nutritional status and the prevalence of anemia (p <0.05).

Based on the number of pregnancies and births, the proportion of anemia sufferers was greater in the group who had been pregnant more than once (25.2%) and had given birth more than once (24.6%). However, the statistical results did not show a significant correlation between the two variables (p> 0.05).

Lack of protein intake showed a significant correlation (p <0.05) with anemia. Likewise, the consumption of green vegetables and fruit also showed a very significant correlation with the incidence of anemia in women who work in horticultural agriculture (p <0.05).

Table 2
Chi-square test for respondent characteristics and anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frequency	(%)	Frequency	(%)	
Nutritional Status					
Dissatisfactory	31	42,5%	42	57,5%	0,000
Good	6	6,9%	81	93,1%	
Total Pregnancy					
Risk	33	25,2%	98	74,8%	0,283
Good	4	13,8%	25	86,2%	
Total Births					
Risk	29	24,6%	89	75,4%	0,605
Good	8	19,0%	34	81,0%	
Protein Intake					
Lack	29	63,0%	17	37,0%	0,000
Good	8	7,0%	106	93,0%	
Vegetables Consumption					
Lack	25	55,6%	20	44,4%	0,000
Good	12	10,4%	103	89,6%	
Fruit Consumption					
Lack	16	47,1%	18	52,9%	0,000
Good	21	16,7%	105	83,3%	

Variables with a p-value <0.25 were continued to multivariate analysis to identify risk factors and determine the relationship between risk factors and anemia. The analysis was performed using Logistic Regression (alpha = 0.05).

Table 3.
Logistic Regression Test on Risk Factors for Aemia

Variables	Anemia Frequency (%)	Normal Frequency (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Nutritional Status				
Dissatisfactory	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)	24,53 (5,59-107,70)
Good	6 (6,9%)	81 (93,1%)	1	1
Protein Intake				
Lack	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)	28,01 (6,97-112,52)
Good	8 (7,0%)	106 (93,0%)	1	1
Vegetables Consumption				
Lack	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)	6,13 (1,79-21,01)
Good	12 (10,4%)	103 (89,6%)	1	1

In the analysis (Table 3), there are three risk factors for anemia among women who work in horticultural agriculture in West Lampung Regency: nutritional status, protein intake, and vegetable consumption. Dissatisfactory nutritional status increases the risk of anemia by 24.53 times (5.59-107.70). Lack of protein intake is the dominant risk factor for anemia, amounting to 28.01 times (6.97-112.52). Meanwhile, lack consumption of green vegetables shows a risk of 6.13 times (1.79-21.01).

The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5% (Table 1). This result is greater than some previous research reports, amounting to 22.7% (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). This condition can increase morbidity and mortality, impaired neurological development, decreased productivity due to fatigue, illness, and cognitive impairment (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b; Teshale et al., 2020).

Anemia in the WRA group will also increase the risk of experiencing anemia during pregnancy so that it has the potential to cause complications of pregnancy and childbirth (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Pregnancy complications include premature birth, infant mortality in the womb, impaired fetal growth leading to low birth weight and stunted babies (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta et al., 2021). While labor complications are bleeding, that can cause maternal death (Chrispinus Siteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

The WRA group is at high risk of developing anemia, apart from toddlers and pregnant women (Chaparro & Suchdev, 2019; Chrispinus Siteti, 2014; Shah & Gupta, 2002). Physiologically, WRA is prone to anemia because they experience menstrual cycles every month so that there is an increased need for iron (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Pasalina et al., 2019; Priyanto, 2018; Sudikno & Sandjaja, 2016; WHO, 2004; Wijayanti & Fitriani, 2019). In one menstrual period, the amount of blood lost is around 20-25 cc, or the equivalent of losing iron around 12.5-15.0 mg/month or about 0.4-0.5 mg a day (Sya`Bani & Sumarmi, 2016). So it requires more iron intake to replace lost iron (Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Anemia in adolescents and WRA will continue during pregnancy (Azwar, 2004), so that it becomes an independent predictor of anemia during pregnancy (Demmouche, S, & S, 2011). Nutritional problems in certain age groups will affect nutritional status in the next life cycle period (intergenerational impact) (Azwar, 2004; Demmouche et al., 2011). So that the effort to control anemia in pregnant women is to ensure the fulfillment of iron needs before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Research has proven that nutritional status is a risk factor for anemia (AOR = 24.53; 95% CI 5.59-107.70). The results of this

study are consistent with several previous studies which state that nutritional status is closely related to the prevalence of anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway, Mewo, & Assa, 2020; Sudikno & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Nutritional status was determined based on the calculation of body mass index (BMI), then categorized as thin (BMI <18.5 kg / m2), normal (BMI 18.5-22.9 kg / m2), obese (BMI 23.0-24 , 9 kg / m2), obesity I (BMI 25.0-29.9 kg / m2), and obesity II (BMI ≥ 30.0 kg / m2) (Kanazawa et al., 2005). In this study, cases of anemia were mostly found in underweight women. The results of this study are following the results of previous studies, which concluded that anemia sufferers were more often found in WRA with the thin category (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Nutritional requirements and age are related to the prevalence of anemia. In etiology, increasing age will be followed by a decrease in bone marrow erythroid progenitor, resulting in a decrease in the number of red blood cells released into the bloodstream. Bone marrow decline begins at 30 years by 30% and increases to 50% at the age above 60 years (Mahlknecht & Kaiser, 2010). Not meeting nutritional needs causes a decrease in the production of red blood cells, resulting in anemia (Demmouche et al., 2011; Mantika & Mulyati, 2014). Nutritional status and anemia provide a picture of chronic malnutrition (Azwar, 2004).

This research found that lack of protein intake and consumption of vegetables high in iron was a risk factor for anemia (Table 3). Lack protein intake gives a risk of 28.01 times (6.97-112.52), and lack consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the leading cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection, and thalassemia (Chaparro & Suchdev, 2019). Lack protein intake, energy, and iron in food is a significant factor that can trigger anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Hemoglobin synthesis requires the availability of iron and protein in sufficient quantities as the main component of heme formation in hemoglobin (Marcia, Ketryn, Karen, & Long, 2010; Wijayanti & Fitriani, 2019). Protein is also a main component of globin which plays a role in iron transport and storage (Marcia et al., 2010; Siahaan, Siallagan, Purba, & Oppusungu, 2018; Wijayanti & Fitriani, 2019). If the body lacks protein, the transport of iron into the blood plasma will be disrupted to affect blood hemoglobin levels (Sya`Bani & Sumarmi, 2016). Research by Thomson et al., which involved a cohort of 963,676 people, concluded that the lower the protein intake, the lower the hemoglobin level in the blood (Thomson et al., 2011). Lack of protein and iron causes a decrease in the formation of red blood cells resulting in reduced red blood cells in the body and causes anemia (Cavalcanti, de Vasconcelos, Muniz, dos Santos, & Osório, 2014). The relationship between protein intake adequacy was also presented in several other studies (Azizah & Adriani, 2018; Azwar, 2004; Barth-Jaeggi et al., 2020; Mantika & Mulyati, 2014; Setyaningsih, AP, & Nurwijayanti, 2014; Wijayanti & Fitriani, 2019).

Iron is found in meat, fish, poultry (heme iron), and plants such as vegetables, fruit, and seeds (non-heme iron). The body more readily absorbs iron derived from heme than non-heme (Mantika & Mulyati, 2014). Iron deficiency causes iron stores in the body to decrease so that the supply to the bone marrow for hemoglobin formation is insufficient. As a result, the number of free protoporphyrin erythrocytes increases, resulting in the production of microcytic erythrocytes, and the hemoglobin value decreases (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Work on horticultural agriculture poses a risk of exposure to large amounts of pesticides which result in poisoning (Sulistyawati, Margawati, Rosidi, & Suhartono, 2019; Yushananta et al., 2020). Pesticides are included in the group of chemical hazardous toxic substances and the endocrine disrupting chemicals (EDCs), namely chemical compounds that can interfere with the synthesis, secretion, transport, metabolism, binding action, and elimination of natural hormones that function to maintain homeostasis, reproduction, and growth and development processes (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia is one of the long-term effects of pesticide poisoning (Agustina & Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari & Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). The formation of sulfhemoglobine and methemoglobine compounds in the blood due to pesticide poisoning causes a decrease in hemoglobin levels in red blood cells, which results in anemia (Britt & Budinky A, 2000; George et al., 2014; G. S. Nutakki et al., 2016; G. Nutakki et al., 2017; Pinkhas & All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

In this research, it is known that the food sources of protein intake are fish, eggs, and meat. Meanwhile, the dominant type of vegetables is green vegetables. However, 28.8% and 28.1% (Table 1) consumed insufficient amounts. Insufficient consumption, difficulty in absorbing non-heme iron, and exposure to pesticides are thought to be the causes of the high prevalence of anemia in the study sites. Efforts are needed to increase the amount of protein, iron, and other micronutrients through good food selection and improved diet. The absorption of iron can be achieved optimally if the dish consists of a combination of food ingredients that contain high iron in animals (heme), vegetables (non-heme), vitamin-A, vitamin-B, and vitamin-C (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011; Basith, Agustina, & Diani, 2017; Bharati, Som, Chakrabarty, Bharati, & Pal, 2008; Ghosh et al., 1980; Prihartono et al., 2011). The selection of good food is expected to prevent or overcome anemia (Stephen et al., 2018). Efforts for fortification and supplementation of Fe tablets are an essential part to be carried out by health authorities to WRA. Control of anemia in pregnant women ensures the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

CONCLUSIONS AND SUGGESTIONS

Anemia continues to be a widespread and significant public health problem, so it must be treated adequately. The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5%, higher than the previous report (22.7%). Three risk factors for anemia were found, namely dissatisfactory nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and lack consumption of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Increasing protein and iron intake is an intervention that must be implemented immediately, both through food selection and food menu improvements. Give special attention to chronic anemia in the WRA group, post menarche adolescents, and the poor through fortification and supplementation of Fe tablets.

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Conflict of Interest

The author declares there is no conflict of interest.

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Anemia and Its Associated Factors Among Women of Reproductive Age in Horticulture Area

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A B S T R A C T

Anemia continues to be an important and widespread public health problem, so it must be addressed. About 1.74 (1.72-1.76) billion people worldwide suffer from anemia, especially children under five, Women of Reproductive Age (WRA), and pregnant women. As many as 500 million WRA suffer from anemia; this will impact the loss of productivity due to decreased work capacity, cognitive impairment, susceptibility to infections, and increased risk of complications in pregnancy and childbirth. This study analyzes the risk factors for anemia in women of reproductive age (15-49) who work in horticultural agriculture. The study was conducted with a cross-sectional design involving 160 participants from three main centers of horticultural agriculture in West Lampung Regency. SPSS was used for Chi-square analysis, Odds Ratio, and Logistic Regression (alpha = 0.05). The results showed that the prevalence of anemia in women of reproductive age who worked in horticultural agriculture was 27.5%. The study also identified three risk factors for anemia: dissatisfactory nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97- 112.52), and lack intake of high iron vegetables (AOR = 6.13; 95% CI 1.79-21.01). Nutritional interventions should emphasize increasing protein, iron, and vitamins through improved diet, fortification efforts, and iron supplementation.

Anemia dan Faktor yang Terkait pada Wanita Usia Subur di Daerah Pertanian Hortikultura

Kata kunci:

Anemia
Wanita usia subur
Petani
Protein
Zat besi

A B S T R A K

Anemia masih terus menjadi masalah kesehatan masyarakat yang penting dan meluas, sehingga harus ditangani. Sekitar 1,74 (1,72-1,76) miliar penduduk dunia menderita anemia, terutama anak balita, Wanita Usia Subur (WUS) dan wanita hamil. Sebanyak 500 juta WUS menderita anemia, ini akan berdampak pada hilangnya produktivitas karena penurunan kapasitas kerja, gangguan kognitif, dan kerentanan terhadap infeksi, serta meningkatkan risiko komplikasi kehamilan dan persalinan. Penelitian bertujuan menganalisis faktor risiko anemia pada wanita usia subur (15-59) yang bekerja pada pertanian hortikultura. Penelitian dilakukan dengan rancangan cross sectional, melibatkan 160 orang partisipan dari tiga sentra utama pertanian hortikultura di Kabupaten Lampung Barat. SPSS digunakan untuk analisis Chi-square, Odds Ratio, dan Logistic Regression (alpha=0,05). Hasil penelitian mendapatkan prevalensi anemia pada wanita usia subur yang bekerja pada pertanian hortikultura sebesar 27,5%. Penelitian juga mendapatkan tiga faktor risiko untuk anemia: status gizi yang kurang baik (AOR=24,53; 95%CI 5,59-107,70), kurang konsumsi protein (AOR=28,01; 95%CI 6,97-112,52), dan kurang konsumsi sayuran tinggi zat besi (AOR=6,13; 95%CI 1,79-21,01). Intervensi gizi harus menekankan pada peningkatan asupan protein, zat besi dan vitamin, baik melalui perbaikan menu makanan, upaya fortifikasi dan suplementasi tablet Fe.

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INTRODUCTION

Anemia is still a very important public health problem around the world, especially in developing countries. Anemia contributes to increased morbidity and mortality, decreased work productivity, neurological development disorders, and the risk of complications of pregnancy and childbirth (Chaparro &Suchdev, 2019; Mantika&Mulyati, 2014; Teshale, Tesema, Worku, Yeshaw, & Tessema, 2020). In the long term, anemia has a major impact on health, economic and social welfare conditions (Priyanto, 2018; Teshale et al., 2020).

In 2019, anemia caused 58.6 (40.14-81.1) million years of living with disabilities (YLDs = Years Lived with Disability) (Gardner &Kassebaum, 2020). Anemia results from an imbalance between erythrocyte loss relative to production, caused by ineffective or ineffective erythropoiesis (for example, from nutritional deficiency, inflammation, or genetic Hb disorder) and / or excessive erythrocyte loss (due to hemolysis, blood loss, or both) (Chaparro &Suchdev, 2019).

Globally, the prevalence of anemia for all ages in 2019 is 22.8% (95% CI: 22.6-23.1), or around 1.74 (1.72-1.76) billion (Gardner &Kassebaum, 2020). The regions with the highest burden are in the tropics, especially Africa, Asia, the Caribbean and Oceania (Chaparro &Suchdev, 2019; Gardner &Kassebaum, 2020; Kassebaum et al., 2014; Priyanto, 2018). Women are consistently at greater risk of developing anemia than men (Chaparro &Suchdev, 2019; Kassebaum et al., 2014; WHO, 2012). The most vulnerable population groups are children under the age of five (toddlers), women of reproductive age (WRA), and pregnant women (Chaparro &Suchdev, 2019; Shah & Gupta, 2002). Approximately 500 million (Teshale et al., 2020; WHO, 2012), and 41.8% of pregnant women suffer from anemia (Chaparro &Suchdev, 2019; WHO, 2012).

The anemia situation in Indonesia is no different from the global situation. Anemia cases were more common in women (27.2%) than men (20.3%), living in rural areas (25.0%) than in urban areas (22.7%) (Kemenkes RI, 2018a). Likewise, for vulnerable groups, children under five (38.5%), WRA (22.7%), and pregnant women (48.9%) (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). Anemia in pregnant women increased from 37.1% (2013) to 48.9% (2018) (Kemenkes RI, 2018a). In addition, the WRA group also saw an increase from 19.7% (2007) to 22.7% (2013) (Kemenkes RI, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019)

More than half of anemia cases in the world are caused by a lack of iron which plays a role in erythropoiesis and the formation of hemoglobin. Other nutritional factors that play a role are insufficient intake of protein, folate, vitamin-A, vitamin-B, vitamin-C, and zinc (Gardner &Kassebaum, 2020; Pasalina, Jurnalis, &Ariadi, 2019; Sahana &Sumarmi, 2015; Sudikno&Sandjaja, 2016; Teshale et al., 2020; Widyarni&Qoriati, 2019; Wijayanti&Fitriani, 2019). Based on the Decree of the Minister of Health of the Republic of Indonesia Number 736a / Menkes / XI / 1989, an adult woman is declared anemic if the hemoglobin (Hb) level in the blood is below normal, which is less than 12.0 g / dL, while in a pregnant woman it is less than 11.0 g / dL (Kemenkes RI, 2020).

Anemia contributes to increased morbidity and mortality, decreased work productivity due to fatigue, cognitive decline, and neurological development disorders (Chaparro &Suchdev, 2019; Kemenkes RI, 2018b). In pregnancy, anemia increases the risk of bleeding, premature birth, infant mortality in the womb, impaired fetal growth resulting in low birth weight (LBW) and stunted babies, and causes indirect maternal death (Destarina, 2018; Eskenaziet al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Teshale et al., 2020; Whyatt et al., 2004; Yushananta, Ahyanti, &Anggraini, 2020, 2021) .

Apart from being influenced by nutritional and physiological problems, anemia can also be influenced by environmental factors, one of which is pesticide poisoning. Pesticide poisoning causes nervous system disorders (such as headaches, paresthesias, tremors, discoordination, seizures) due to the accumulation of acetylcholine in nerve tissue and in vector organs. In the long term (chronic), it causes weight loss, anemia, anorexia, and impaired liver function (Agustina &Norfai, 2018; Arwin&Suyud, 2016; Azmi, Naqvi, Azmi, & Aslam, 2006; Fauziyyah, Suhartono, &Astorina , 2017; Nassar, Salim, &Malhat, 2016; Neghab, Jalilian, Taheri, Tatar, & Haji Zadeh, 2018; Okvitasari& Anwar, 2017; Patil, Patil, &Govindwar, 2003; Prasetyaningsih, Arisandi & Retnosetiawati, 2017; Yushananta et al., 2020).

In the case of pesticide poisoning, sulfhemoglobine is formed from the sulfur content in pesticides, as well as methemoglobine due to excessive oxidation so that the ferrous compounds turn into ferries. The formation of sulfhemoglobine and methemoglobine will interfere with the function of hemoglobin in delivering oxygen (Britt &Budinky A, 2000; George, Shaikh, Thomas, &Kundavaram, 2014; GS Nutakki, Madhav Makineni, &Madhukiran, 2016; G. Nutakki, Siripurapu, Kumar, &SasiSekhar, 2017; Pinkhas& All, 1963; Shihana, Dawson, & Buckley, 2016). The largest use of pesticides is especially in agriculture, horticulture, which uses large doses of pesticides and continuously during the growing season (Yushananta et al., 2020).

West Lampung Regency has the largest horticultural farming area in Lampung Province and is the largest source of regional income (53.81% of GRDP). Horticultural land area reaches 1,254 hectares with a production of 237,500 tons of vegetables (BPS, 2019). Until now, there are still few studies that discuss anemia in female women who work with pesticide exposure. This study aims to analyze the risk factors for anemia in women of reproductive age (WRA) (15-59) who work in horticultural agriculture.

METHOD

A cross sectional study was conducted in West Lampung Regency, to determine the risk factors for anemia in women of reproductive age (WRA) (15-59) who work in horticultural agriculture. Three sub-districts as the main horticultural agricultural centers were chosen to follow the area of agriculture and the amount of horticultural agricultural production (BPS, 2019), namely Balik Bukit, Sukau and Sekincau Districts. The research was conducted after obtaining approval from the Health Research Ethics Committee, Tanjungkarang Health Polytechnic (No.211 / EA / KEPK-TJK / VII / 2019) and permission from the West Lampung District Health Office. Guided by the Helsinki protocol, participant informed consent was taken, and data handling was confidential. There is no risk of harm to participants, and all participants have the right to withdraw during the study. All study procedures were explained prior to the interview.

The study was conducted from July up to August 2019. Women of reproductive age (WRA) aged 15-49 years were selected purposively. Women who were pregnant, had blood disorders, were taking drugs that inhibited iron absorption were excluded from the study. Respondents are declared

anemic, if the blood Hb level is <12 gr / dL and normal if the blood Hb level is ≥ 12 gr / dL (Kemenkes RI, 2020).

The sample is calculated based on the infinite population, with the prevalence of anemia in WRA from previous studies, amounting to 22.7% (Kemenkes RI, 2013, 2018a; Sudikno & Sandjaja, 2016). The sample size calculation follows the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} . P . (1-P)}{d^2}$$

Where, n = number of samples, P = attribute proportion (0.227), d = precision (10%), 1 - P = proportion of non-attribute (0.511), Z 1-α / 2 = Z value at alpha 5% (1, 96). The results of the calculation of the minimum sample size are 68 women of reproductive age (WRA). However, in this study, data were collected from 160 samples. So that the precision (d) increases to 6.5%.

Data were collected from measurements and interviews using a questionnaire. All blood samples were taken and analyzed using the Hemocue Point of Care Testing (POCT) method. Height and weight were measured by WHO standard measurements. All respondents were asked about their diet, type and amount of food they usually consume.

The data was entered into SPSS (24.0) after completing it was checked, edited, and coded. Univariate analysis is used to describe the distribution of each research variable with frequency and proportion. Bivariate analysis used Chi-square statistics to measure variables associated with anemia. Variables with p value <0.25 were continued to multivariate analysis to identify risk factors. To determine the relationship between risk factors and anemia, a Logistic Regression analysis was used. Odds Ratio (OR) and 95% Confident Interval (CI) calculations were also performed. For all statistical tests, p-value ≤ 0.05 was considered significant.

RESULTS AND DISCUSSION

The results (Table 1) found that 27.5% of women of reproductive age (WRA) who work in horticultural agriculture suffer from anemia. The proportion of respondents with good nutritional status (54.4%) was slightly higher than those with dissatisfactory nutrition (45.6%). All respondents (n = 160), the majority of respondents (81.9%) had been pregnant more than once (multigravida), and (73.8%) gave birth to live babies more than once (multiparous), so they are at risk of developing anemia.

Table 1 also describes the eating habits and types of food that the respondents usually consume. Based on the results of the interviews, the majority of respondents (71.3%) had intake adequate amounts of protein. However, it was found that 28.8% were still experiencing shortages. The types of side dishes that are often intake as a source of protein and iron are fish, eggs and meat. As many as 71.9% of respondents have intake types of green vegetables that are high in iron, including cassava leaves, kale, genjer*(edible riverine plant)*, papaya leaves, mustard greens, and pumpkin leaves. Likewise for fruit intake, the majority (78.8%) had intake fruits high in vitamin-C and vitamin-A content, such as oranges, mangoes, bananas, and papayas.

Table 1
Respondents Characteristics

Variables	Frequency (n)	Percentage (%)
Anemia's Status		
Anemia	44	27,5
Normal	116	72,5
Nutritional Status		
Dissatisfactory	73	45,6
Good	87	54,4
Total Pregnancy		
Risk	131	81,9
Good	29	18,1
Total birth		
Risk	118	73,8
Good	42	26,3
Protein Intake		
Lack	46	28,8
Good	114	71,3
Vegetable intake		
Lack	45	28,1
Good	115	71,9
Fruit Intake		
Lack	34	21,3
Good	126	78,8

Bivariate analysis was performed to determine the correlation between each research variable and the prevalence of anemia, using the Chi-square test at alpha = 0.05. From Table 2, it can be seen that in the group suffering from anemia, 42.5% had a dissatisfactory nutritional status. The analysis showed a significant relationship between nutritional status and the prevalence of anemia (p <0.05).

Based on the number of pregnancies and births, the proportion of anemia sufferers was greater in the group who had been pregnant more than once (25.2%) and had given birth more than once (24.6%). However, the statistical results did not show a significant correlation between the two variables (p> 0.05).

Lack of protein intake showed a significant correlation (p <0.05) with anemia. Likewise, the intake of green vegetables

and fruit also showed a very significant correlation with the prevalence of anemia in women who work in horticultural agriculture (p <0.05).

Table 2
Chi-square test of Respondents Characteristics and Anemia

Variables	Anemia (n=37)		Normal (n=123)		p-value
	Frequency	(%)	Frequency	(%)	
NutritionalStatus					
Dissatisfactory	31	42,5	42	57,5	0,000
Good	6	6,9	81	93,1	
Total Pregnancy					
Risk (more than once)	33	25,2	98	74,8	0,283
Good (once)	4	13,8	25	86,2	
Total Birth					
Risk (more than once)	29	24,6	89	75,4	0,605
Good (once)	8	19,0	34	81,0	
Protein Intake					
Lack	29	63,0	17	37,0	0,000
Good	8	7,0	106	93,0	
Vegetable Intake					
Lack	25	55,6	20	44,4	0,000
Good	12	10,4	103	89,6	
Fruit Intake					
Lack	16	47,1	18	52,9	0,000
Good	21	16,7	105	83,3	

Variables with p value <0.25 were continued to multivariate analysis to identify risk factors and determine the correlation between risk factors and anemia. The analysis was performed using Logistic Regression (alpha = 0.05).

Tabel 3.
Logistic Regression Test on the Risk Factors of Anemia

Variables	Anemia Frequency (%)	Normal Frequency (%)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
NutritionalStatus				
Dissatisfactory	31 (42,5%)	42 (57,5%)	9,96 (3,85-25,77)	24,53 (5,59-107,70)
Good	6 (6,9%)	81 (93,1%)	1	1
Protein Intake				
Dissatisfactory	29 (63,0%)	17 (37,0%)	22,60 (8,87-57,59)	28,01 (6,97-112,52)
Good	8 (7,0%)	106 (93,0%)	1	1
Vegetable Intake				
Dissatisfactory	25 (55,6%)	20 (44,4%)	10,73 (4,64-24,82)	6,13 (1,79-21,01)
Good	12 (10,4%)	103 (89,6%)	1	1

In the analysis (Table 3), there are three risk factors for anemia among women who work in horticultural agriculture in West Lampung Regency, namely nutritional status, protein intake, and vegetable intake. dissatisfactory nutritional status increases the risk of anemia by 24.53 times (5.59-107.70). Lack of protein intake is the dominant risk factor for anemia, amounting to 28.01 times (6.97-112.52). Meanwhile, less intake of green vegetables shows a risk of 6.13 times (1.79-21.01).

The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5% (Table 1). This result is greater than some previous research reports, amounting to 22.7% (Ministry of Health, 2013; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019). This condition has the potential to increase morbidity and mortality, impaired neurological development, decreased productivity due to fatigue, illness, and cognitive impairment (Chaparro & Suchdev, 2019; Kemenkes RI, 2018b; Teshale et al., 2020).

Anemia in the women of reproductive age (WRA) group will also increase the risk of experiencing anemia during pregnancy, so that it has the potential to cause complications of pregnancy and childbirth (Chrispinus Siteti, 2014; Wijayanti & Fitriani, 2019). Pregnancy complications include premature birth, infant mortality in the womb, impaired fetal growth leading to low birth weight and stunted babies (Chaparro & Suchdev, 2019; Destarina, 2018; Eskenazi et al., 2004; Jaacks et al., 2019; Petit et al., 2012, 2010; Sudikno & Sandjaja, 2016; Whyatt et al., 2004; Yushananta et al., 2021). While labor complications are bleeding that can cause maternal death (ChrispinusSiteti, 2014; Sudikno & Sandjaja, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

The women of reproductive age (WRA) group are one of the groups at high risk of developing anemia, apart from toddlers and pregnant women (Chaparro &Suchdev, 2019; Chrispinus Siteti, 2014; Shah & Gupta, 2002). Physiologically, women of reproductive age (WRA) are prone to anemia because they experience menstrual cycles every month so that there is an increased need for iron (Chaparro & Suchdev, 2019; Mantika & Mulyati, 2014; Pasalina et al., 2019; Priyanto, 2018; Sudikno & Sandjaja, 2016; WHO, 2004;

Wijayanti & Fitriani, 2019). In one menstrual period, the amount of blood lost is around 20-25 cc, or the equivalent of losing iron around 12.5-15.0 mg / month or about 0.4-0.5 mg a day (Sya`Bani & Sumarmi, 2016). So it requires more iron intake to replace lost iron (Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Anemia in adolescents and women of reproductive age (WRA) will continue during pregnancy (Azwar, 2004), so that it becomes an independent predictor of anemia during pregnancy (Demmouche, S, & S, 2011). Nutritional problems in certain age groups will affect nutritional status in the next life cycle period (intergenerational impact) (Azwar, 2004; Demmouche et al., 2011). So that the effort to control anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani & Sumarmi, 2016).

Research has proven that nutritional status is a risk factor for anemia (AOR = 24.53; 95% CI 5.59-107.70). The results of this research are consistent with several previous studies which state that nutritional status is closely related to the prevalence of anemia (Mariana, 2013; Pasalina et al., 2019; Priyanto, 2018; Sahana & Sumarmi, 2015; Sikoway, Mewo & Assa, 2020; Sudikno. & Sandjaja, 2016; Sya`Bani & Sumarmi, 2016; Widyarni & Qoriati, 2019; Wijayanti & Fitriani, 2019).

Nutritional status was determined based on the calculation of body mass index (BMI), then categorized as thin (BMI <18.5 kg / m2), normal (BMI 18.5-22.9 kg / m2), obese (BMI 23.0-24 , 9 kg / m2), obesity I (BMI 25.0-29.9 kg / m2), and obesity II (BMI ≥ 30.0 kg / m2) (Kanazawa et al., 2005). In this study, cases of anemia were mostly found in women who were underweight. The results of this study are in accordance with the results of previous studies which concluded that anemia sufferers were more often found in WRA with the thin category (Sihombing & Riyadina, 2009; Sudikno & Sandjaja, 2016; Wijayanti & Fitriani, 2019).

Nutritional requirements and age are related to the prevalence of anemia. In etiology, increasing age will be followed by a decrease in bone marrow erythroid progenitor, resulting in a decrease in the number of red blood cells released into the bloodstream. Bone marrow decline begins at the age of 30 years by 30% and increases to 50% at the age above 60 years (Mahlknecht & Kaiser, 2010). Not meeting nutritional needs causes a decrease in the production of red blood cells, resulting in anemia (Demmouche et al., 2011; Mantika&Mulyati, 2014). Nutritional status and anemia provide a picture of chronic malnutrition (Azwar, 2004).

This research found that lack of protein intake and consumption of vegetables high in iron was a risk factor for anemia (Table 3). Lack protein intake gives a risk of 28.01 times (6.97-112.52) and lack consumption of vegetables high in iron gives a risk of 6.13 times (1.79-21.01). Lack of protein and iron intake is the leading cause of anemia, in addition to deficiencies of vitamin-A, vitamin-B, vitamin-C, infection, and thalassemia (Chaparro & Suchdev, 2019). Lack protein intake, energy, and iron in food is a significant factor that can trigger anemia (Hunt, 2003; Mantika & Mulyati, 2014).

Hemoglobin synthesis requires the availability of iron and protein in sufficient quantities as the main component of heme formation in hemoglobin (Marcia, Ketryn, Karen, & Long, 2010; Wijayanti&Fitriani, 2019). Protein is also a major component of globin which plays a role in iron transport and storage (Marcia et al., 2010; Siahaan, Siallagan, Purba, & Oppusungu, 2018; Wijayanti & Fitriani, 2019). If the body lacks protein, the transport of iron into the blood plasma will be disrupted so that it will affect blood hemoglobin levels (Sya`Bani & Sumarmi, 2016). Research by Thomson et al, which involved a cohort of 963,676 people concluded that the lower the protein intake, the lower the hemoglobin level in the blood (Thomson et al., 2011). Lack of protein and iron causes a decrease in the formation of red blood cells resulting in reduced red blood cells in the body and causes anemia (Cavalcanti, de Vasconcelos, Muniz, dos Santos, & Osório, 2014). The relationship between protein intake adequacy was also presented in several other studies (Azizah & Adriani, 2018; Azwar, 2004; Barth-Jaeggi et al., 2020; Mantika & Mulyati, 2014; Setyaningsih, AP, &Nurwijayanti, 2014; Wijayanti & Fitriani, 2019).

Iron is found in foods such as meat, fish and poultry (heme iron) and in plants such as vegetables, fruit and seeds (nonheme iron). Iron derived from heme is more easily absorbed by the body than non-heme (Mantika & Mulyati, 2014). Iron deficiency causes iron stores in the body to decrease, so that the supply to the bone marrow for hemoglobin formation is insufficient. As a result, the number of free protoporphyrin erythrocytes increases, resulting in the production of microcytic erythrocytes and the hemoglobin value decreases (Hunt, 2003; Marcia et al., 2010; Thomson et al., 2011).

Working on horticultural agriculture poses a risk of exposure to large amounts of pesticides which result in poisoning (Sulistyawati, Margawati, Rosidi, &Suhartono, 2019; Yushananta et al., 2020). Pesticides are included in the group of chemical hazardous toxic substances and the endocrine disrupting chemicals (EDCs), namely chemical compounds that can interfere with the synthesis, secretion, transport, metabolism, binding action and elimination of natural hormones that function to maintain homeostasis, reproduction and growth and development processes (Diamanti-Kandarakis et al., 2009; Sulistyawati et al., 2019).

Anemia is one of the long-term effects of pesticide poisoning (Agustina &Norfai, 2018; Arwin & Suyud, 2016; Azmi et al., 2006; Fauziyyah et al., 2017; Nassar et al., 2016; Neghab et al., 2018; Okvitasari&Anwar, 2017; Patil et al., 2003; Prasetyaningsih et al., 2017; Yushananta et al., 2020). The formation of sulfhemoglobine and methemoglobine compounds in the blood due to pesticide poisoning causes a decrease in hemoglobin levels in red blood cells which results in anemia (Britt &Budinky A, 2000; George et al., 2014; GS Nutakki et al., 2016; G. Nutakki et al., 2017; Pinkhas& All, 1963; Shihana et al., 2016; Sulistyawati et al., 2019).

In this research, it is known that the food sources of protein intake are fish, eggs, and meat. Meanwhile, the dominant type of vegetables is green vegetables. However, 28.8% and 28.1% (Table 1) intake insufficient amounts. Insufficient intake, difficulty in absorbing non-heme iron, and exposure to pesticides are thought to be the causes of the high prevalence of anemia in the study sites. Efforts are needed to increase the amount of protein, iron, and other micronutrients through good food selection and improved diet. The absorption of iron can be achieved optimally if the dish consists of a combination of food ingredients that contain high iron in animals (heme), vegetables (non-heme), vitamin-A, vitamin-B, and vitamin-C (Balarajan, Ramakrishnan, Özaltin, Shankar, & Subramanian, 2011; Basith, Agustina, & Diani, 2017; Bharati, Som, Chakrabarty, Bharati, & Pal, 2008; Ghosh et al., 1980; Prihartono et al., 2011). Selection of good food is expected to prevent or overcome anemia (Stephen et al., 2018). Efforts for fortification and supplementation of Fe tablets are an important part to be carried out by the health authorities to WRA. Control of anemia in pregnant women is to ensure the fulfillment of iron needs in the period before pregnancy (Mariana, 2013; Priyanto, 2018; Sya`Bani&Sumarmi, 2016)

CONCLUSIONS AND SUGGESTIONS

Anemia continues to be a widespread and significant public health problem, so it must be treated adequately. The results showed that the prevalence of anemia among women working in horticultural agriculture was 27.5%, higher than the previous report (22.7%). Three risk factors for anemia were found, namely dissatisfactory nutritional status (AOR = 24.53; 95% CI 5.59-107.70), lack of protein intake (AOR = 28.01; 95% CI 6.97-112, 52), and lack consumption of high-iron vegetables (AOR = 6.13; 95% CI 1.79-21.01).. Increasing protein and iron intake is an intervention that must be implemented immediately, both through food selection and food menu improvements. Give special attention to chronic anemia in the group of WRA, post menarche adolescents, and the Dissatisfactory through fortification and supplementation of Fe tablets.

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Conflict of Interest

The author states there is no conflict of interest.

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