Original Article

Prevalence and factors associated with anaemia among pregnant women attending antenatal care in a district hospital and its feeder community healthcare centre of the Limpopo Province, South Africa

Thembelihle S. Ntuli[1], Oratilwe P. Mokoena[1], Eric Maimela[2], Khanyisa Sono[3]

[1]Department of Statistical Sciences, Sefako Makgatho Health Sciences University, Medunsa, South Africa, [2]Department of Public Health, University of Limpopo, Sovenga, South Africa, [3]Department of Public Health Medicine, University of Limpopo, Sovenga, South Africa

Abstract

Background: Pregnancy anaemia is a significant public health concern in South Africa (SA), particularly in rural areas, but little is known about its prevalence and risk factors in rural areas. The objective of the study was to determine the prevalence and identify risk factors of pregnancy anaemia in the public health facilities of Limpopo Province (LP), SA. **Methods:** A cross-sectional study was conducted among a consecutive sample of 211 pregnant women attending antenatal care at Seshego Hospital and its feeder health centre (May to June 2019). Anaemia was defined as haemoglobin (Hb) <11 g/dL and classified as mild (10–10.9 g/dL), moderate (7–9.9 g/dL) and severe anaemia (<7 g/dL). A multiple logistic regression analysis was used to identify predictors of anaemia. **Results:** The mean age of the women was 28.4 ± 5.7 years (range from 18 to 41 years). Over half (52%) had secondary education, 65% were unmarried, 72% were unemployed, 34% were nulliparous, 15% were human immunodeficiency virus (HIV) infected and 67% were in the third trimester. The anaemia prevalence was 18.0% and was significantly associated with parity, HIV status and body mass index (BMI) in a multivariate logistic regression analysis. **Conclusion:** This study found that less than one-third of pregnant women were affected by anaemia, associated with parity, HIV infected and BMI. It is essential to promote routine screening for anaemia, health education and prompt treatment of infections to reduce this burden. In addition, further studies on risk factors for anaemia during pregnancy in both urban and rural communities should be conducted to strengthen these findings.

Keywords: Anaemia, Limpopo Province, pregnant women, risk factors

Introduction

Anaemia in pregnancy continues to be a public health concern that significantly contributes to maternal and foetal consequences. In 2011, approximately 32 million pregnant women were found to be affected by anaemia worldwide, of which the highest prevalence was reported in South Asia and Central and West Africa.[1] Although low haemoglobin (Hb) is used to diagnose anaemia, the definition recommended by different organisations varies considerably. The World Health Organization (WHO) defines anaemia as a Hb concentration of <11 g/dL,[2] while the Centers for Disease Control and Prevention (CDC) defines anaemia as Hb <11 g/dL in the first trimester and <10 g/dL in the second or third trimester.[3] The WHO further classifies anaemia

Address for correspondence: Dr. Oratilwe P. Mokoena, Department of Statistical Sciences, Sefako Makgatho Health Sciences University, P.O. Box 60, Medunsa, 0204, South Africa.
E-mail: oratilwe8250@gmail.com

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in pregnancy according to its severity: mild (10.0–10.9 g/dL), moderate (7–9.9 g/dL) and severe (<7 g/dL).[4] Although this has been challenged, the WHO guideline is still the most commonly used cut-off for defining pregnancy anaemia.[2]

The risk of moderate-to-severe anaemia rises as pregnancy progresses[3,5-10] and contributes to obstetric haemorrhage, caesarean sections and need for postpartum blood transfusion, preeclampsia, intensive care admission and prolonged hospital stay.[11-13] Other adverse outcomes from pregnancy anaemia include low birth weight, preterm delivery, small for gestational age, neonatal intensive care admission, stillbirth and early neonatal death.[14,15] Various causes of anaemia during pregnancy include nutritional deficiencies (e.g., vitamin B_{12}, folic acid and iron) and acute and chronic maternal infections such as malaria and human immunodeficiency virus (HIV).[16,17] Dietary iron deficiency is the most common etiological factor affecting many pregnant women.[16-18]

In South Africa (SA), routine screening of all pregnant women is standard practice. Primary healthcare nurses and medical practitioners are the first contacts for pregnant women to receive maternal care, playing a significant role in identifying and treating anaemia. Still, pregnancy anaemia is associated with 40% of maternal mortality,[19] irrespective of the routine provision of primary care throughout pregnancy.[20] Despite its known effect on pregnancy, there is a paucity of published studies about the prevalence and risk factors that influence anaemia among pregnant women in Limpopo Province (LP). Thus, the contributing risk factors are identified and addressed to develop effective interventions to combat maternal pregnancy anaemia. Therefore, this study was undertaken to determine the prevalence and identify the risk factors associated with anaemia in pregnancy in a district hospital and its feeder community health centre in LP.

Materials and Methods

Study design and setting

A cross-sectional descriptive study was undertaken in Seshego district hospital and its feeder community health centre for two months, from May 01 to June 30, 2019. The institutions are in the Polokwane Municipality of the Capricorn District of LP, SA. The hospital is a 180-bed hospital with only 36 beds allocated for maternity, and on average, 350 pregnant women are seen per month.

Sample size and sampling technique

The minimum sample size of 199 was calculated using the Cochran (1963)[21] single population proportion formula, based on the estimated anaemia prevalence of 36% in LP[20] with a 95% confidence interval, sampling error of 7% and 10% non-response rate. A consecutive sample of pregnant women aged ≥18 who reported to the two healthcare facilities during data collection was asked to participate in the study.

Data collection

A self-administered questionnaire was used for this study. The participants completed the first part of the questionnaire, which included socio-demographic data such as maternal age, place of residence, level of education, marital status and parity, occupation of the women, alcohol intake, smoking status, ferrous sulphate and folic acid given. The second part of the data collection tool was the clinical and anthropometric data related to gestational age, Hb concentration, HIV status, height and weight extracted from the pregnant women's medical records. The Hb level was determined using a B-Hemoglobin system.[22]

After the participants completed the first part of the questionnaire, the research assistant extracted the clinical and anthropometric data from the women's medical records with the midwives' assistance on duty. Body mass index (BMI) was calculated as (weight (kg)/height (m^2); it was recorded as a continuous variable and was available in the women's medical record. For this study, BMI was categorised into four groups: underweight (BMI: <18.5), normal weight (BMI: 18.5–24.5), overweight (BMI: 25–29.9) and obese (BMI ≥30).[23] As study criteria, we used the WHO definition of Hb concentration of <11 g/dL and defined severe anaemia as mild (10.0–10.9 g/dL), moderate (7–9.9 g/dL) and severe (<7 g/dL).[2]

Data analysis

Data were captured and analysed using Microsoft Excel and Statistical software (Stata 9.0, StataCorp, College Station, Texas, United States of America (USA)), respectively. Logistic regression analysis was used to assess risk factors associated with pregnancy anaemia. In the multivariable logistic regression analysis, the researcher incorporated all variables significant at $P < 0.20$ in the univariate model. The cut-off value of less than 0.20 is supported by the literature.[24,25] Maternal age was added to the multivariate model, irrespective of $P > 0.2$, because of its clinical significance.[20] The Hosmer–Lemeshow goodness-of-fit test was used to assess how well the data fit in the final multivariable model and was found not to violate good fit ($P > 0.05$).[26]

Ethical considerations

The researchers obtained ethics approval for the study from the Pietersburg/Mankweng Research Ethics Committee (Ref.: PMREC03UL2019B). The participants completed informed consent before participating in the study.

Results

Socio-demographic characteristics of pregnant women

Two hundred and eleven pregnant women participated in this study. Their mean age was 28.4 ± 5.7 years, ranging from 18 to 41 years. Slightly more than half (56%) of the participants were aged <30 years [Figure 1]. Fifty-two per cent of pregnant women had secondary education, 65% were unmarried, 72%

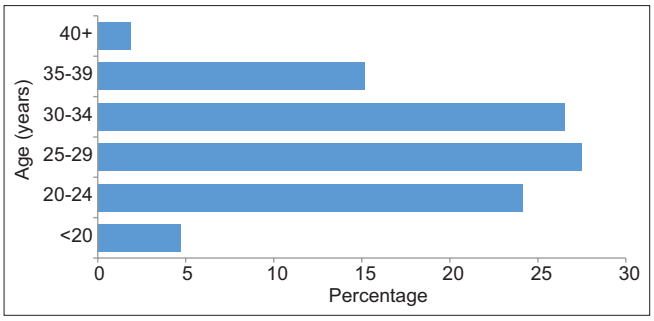

Figure 1: Age distribution of the respondents

were unemployed, 34% were nulliparous, 67% were in the third trimester and 15% were HIV infected.

About 90% and 82% of the women received folic acid and ferrous sulphate supplementation during the current pregnancy. Nearly all (>95%) pregnant women were non-smokers and did not drink alcohol. Forty-eight per cent of the participants were categorised as obese, 33% were overweight and 19% were normal weight.

Prevalence and risk factors for anaemia among pregnant women

The mean ± standard deviation (SD) Hb level concentration was 12.1 g/dl (±1.5). The prevalence of anaemia in pregnancy was 18.0% (n = 38), of which 58% had mild, 37% moderate and 5% severe anaemia [Figure 2].

As displayed in Table 1, risk factors associated with anaemia in the univariate model were level of education, parity, HIV status and BMI. Maternal age was not significantly associated with anaemia in pregnancy ($P > 0.2$), but it was included in the multivariate model because of its clinical influence on anaemia. Women aged 25–29 had 68% fewer odds of anaemia than those aged <20.

Pregnant women with secondary education [OR = 1.98 (95% CI: 0.93–0.421), $P < 0.20$] and primary education [OR = 3.50 (95% CI: 0.58–0.21.22), $P < 0.20$] were more likely to be anaemic compared with those with tertiary education. Pregnant women with multiparous had three times higher odds of being anaemic [OR = 2.92 (95% CI: 1.14; 7.47), $P < 0.20$]. Participants who were HIV positive were also three times more likely to be anaemic than HIV-negative women [OR = 2.95 (95% CI: 1.28; 6.81), $P < 0.20$]. Compared with normal-weight women, overweight and obese women had 59% and 65% significantly fewer odds of having anaemia ($P < 0.2$).

In the multivariate model, the finding revealed that multiparous [OR = 4.77 (95% CI: 1.40; 16.21), $P < 0.05$] and HIV-positive [OR = 2.62 (95% CI: 1.03; 6.64), $P < 0.05$] pregnant women were more likely to be anaemic compared with their counterpart. Obese women had 71% significantly fewer odds of having anaemia than the other groups. Regarding the participants' age, although the results were not statistically significant, women

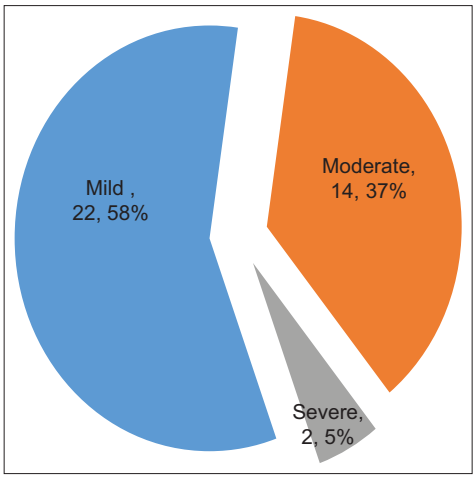

Figure 2: Severity of pregnancy anaemia

in the age group of 25–29 years and 30–34 years had 75% and 74% fewer odds of anaemia than others, respectively.

Discussion

From our study, the prevalence of pregnancy anaemia was 18.0%, comparable to the prevalence rate of 18.0% reported in Tanzania.[9] 25.8% in Uganda[10] and 26.2% in Kenya.[27] However, lower than the rates of 37.51% found in Ethiopia[5], 72.6% in Nigeria[4], 42.7%[28] and 50.8%[8] in Ghana, and 43.1% in Eswatin.[6] Our finding is also lower than the rate of 37% reported in earlier studies in the KwaZulu Natal Province of SA.[7] The possible reason for this variation could be that countries differ in their screening policies, criteria and ethnic differences. Furthermore, it could be different lifestyles and health-seeking behaviours across different countries. In our study, less than half (42%) of the anaemic pregnant women were classified as either moderate or severe anaemia. This result is comparable to a study in Nigeria,[3] but slightly higher than the rates in many studies.[5-8] However, our finding is lower than the rate reported by others.[9,10] There is a concern with 5% of pregnant women with severe anaemia, which need urgent attention. Moreover, those with mild and moderate anaemia could progress into severe anaemia; therefore, they should be treated as an obstetric emergency.

Regarding socio-demographics, the findings of previous studies revealed that anaemia in pregnancy rises as maternal age advances.[8] In contrast, other studies found that anaemia is prevalent among those in the age group less than 25 years.[5-10] Similarly, our finding indicates that pregnant women aged <25 years are at higher risk of developing anaemia in pregnancy, but the result was not statistically significant. Poor knowledge of anaemia in pregnancy is a challenge.[29] Therefore, healthcare professionals should educate pregnant women, especially young people, about the importance of antenatal care.

Previous studies observed no association between level of education and pregnancy anaemia, with illiterate pregnant

Table 1: Risk factors associated with anaemia among pregnant women

	Anaemic	Nonanaemic	Univariate logistic regression		Multivariate logistic regression	
	n (%)	*n* (%)	OR (95% CI)	*P*	OR (95% CI)	*P*
Age (yr)						
<20	3 (30)	7 (70)	Ref		Ref	
20–24	11 (22)	40 (78)	0.64 (0.14;2.89)	0.564	0.67 (0.13;3.39)	0.624
25–29	7 (12)	51 (88)	0.32 (0.07;1.53)	0.154	0.25 (0.04;1.43)	0.119
30–34	10 (18)	46 (82)	0.51 (0.11;2.31)	0.380	0.26 (0.04;1.59)	0.146
35+	7 (19)	29 (81)	0.56 (0.12;2.74)	0.478	0.36 (0.05;2.43)	0.292
Level of education						
Tertiary	12 (13)	84 (87)	Ref			
Secondary	24 (22)	85 (78)	1.98 (0.93;4.21)	0.077		
None/primary	2 (33)	4 (67)	3.50 (0.58;21.22)	0.173		
Marital status						
Married/cohabiting	13 (17)	61 (83)	Ref			
Unmarried	25 (18)	112 (82)	1.05 (0.50;2.19)	0.902		
Employment status						
Employed	10 (17)	49 (83)	Ref			
Unemployed	28 (18)	124 (82)	1.11 (0.50;2.45)	0.803		
Parity						
Nulliparous	9 (13)	62 (87)	Ref		Ref	
Primiparous	13 (17)	64 (83)	1.39 (0.56;3.51)	0.474	2.18 (0.72;6.58)	0.167
Multiparous	16 (25)	47 (75)	2.92 (1.14;7.47)	0.025	4.77 (1.40;16.21)	0.012
Gestational age						
1st trimester	1 (20)	4 (80)	Ref	Ref		
2nd trimester	7 (11)	57 (89)	0.49 (0.05;5.03)	0.549		
3rd trimester	30 (21)	112 (79)	1.07 (0.12;9.95)	0.952		
HIV status						
Negative	27 (15)	152 (85)	Ref		Ref	
Positive	11 (34)	21 (66)	2.95 (1.28;6.81)	0.011	2.62 (1.03;6.64)	0.043
Body mass index						
Normal	13 (32)	28 (68)	Ref		Ref	
Overweight	11 (16)	58 (84)	0.41 (0.16;1.03)	0.057	0.40 (0.15;1.10)	0.078
Obese	14 (14)	87 (86)	0.35 (0.15;0.82)	0.017	0.29 (0.11;0.76)	0.013

OR: Odds ratio, CI: Confidence interval

women found to be anaemic.[6,8,10] Another study revealed that pregnant women's anaemia status was significantly associated with higher education.[5] In univariate analysis, our study finding shows that anaemia is prevalent among women without formal, primary and secondary education. The possible reason could be that less-educated women are likely unemployed, cannot afford to eat nourishing food and enrol early for antenatal care. Furthermore, given that almost all (>80%) women in our study said that they received folic acid and ferrous sulphate supplements, there is a possibility that many were not adherent to treatment. Therefore, healthcare professionals should ensure that pregnant women know about the importance of adherence to nutritional supplements.[30] In addition, this study recommends the involvement of family members to support supplement adherence and dietary changes.[31]

In our study, the HIV prevalence was 15% lower than the provincial rates ranging between 20% and 22% reported in LP and the national antenatal HIV prevalence of 30.7% in RSA.[32] The reason for the lower rate observed in our study is unclear; however, it could be due to its methodological limitations. Studies have shown no association between HIV infection and anaemia in pregnancy.[8,9] Others found that HIV-infected pregnant women were at higher risk of developing anaemia than HIV-uninfected women.[6,33,34] This finding is consistent with the result of our study, which found that a higher proportion of HIV-infected pregnant women were anaemic than uninfected, and the HIV-infected women were three times more likely to develop pregnancy anaemia than HIV uninfected. The increased risk of anaemia among HIV-infected pregnant women could be attributed to lower serum folate, vitamin B and ferritin in pregnancy. Although our study did not assess whether HIV-infected women were on antiretroviral drugs (ARVs), studies have shown that ARVs, mainly zidovudine use, increase the risk of development of anaemia,[35] while another study found no association.[36] Thus, medical practitioners must determine whether HIV-infected pregnant women receive HIV treatment and whether the therapy impacts anaemia.

Consistent with previous studies,[8,10] our findings revealed that marital status and employment status were not associated with pregnancy anaemia. This study found that unmarried and unemployed pregnant women were 1.1 times more likely to be

anaemic, but the results were not statistically significant in a univariate analysis. This finding could be because those pregnant women who are unemployed usually tend to have more critical financial difficulties, which could cause a higher prevalence rate of anaemia in those unemployed. There is an association between parity and anaemia in pregnancy, with prime gravida pregnant women significantly more likely to be anaemic.[10] Other studies found no significant association between parity and pregnancy anaemia.[8] Our study established that multiparous pregnant women were five times more likely to develop anaemia in the multivariate analysis. This finding is similar to other studies,[27] which found that multiparous women are more likely to develop anaemia—because with increasing parity, there is limited time for women to recover from previous pregnancy-related anaemia between successive pregnancies.[27]

In the present study, the risk of pregnant women developing anaemia in pregnancy is lower among overweight or obese women than among women with normal BMI. Consistent with this finding, previous studies showed a similar result of overweight or obese women having a lower risk of developing pregnancy anaemia than women with normal BMI.[14,27] Studies have reported mixed results, which showed that anaemia is more prevalent in the first,[8,16] second[37] and third trimesters[6] of pregnancy. Our finding revealed that more women in the first and third trimesters were anaemic than in the second trimester. Furthermore, those in the third trimester were 1.1 more likely to be developed anaemia than the first-trimester women in the bivariate logistic model, but the result was not statistically significant.

Study limitations

It should be noted that our study was conducted in a district hospital and its feeder community health centre that mainly serve urban communities; therefore, the results cannot be extrapolated to the rural population. It is also important to note that this study was cross-sectional, which limits causality measures.

Conclusion

The anaemia prevalence in pregnancy in our study is comparable in some studies but lower in others and is associated with being HIV infected, primiparous/multiparous and overweight/obese. Given the risk factors for anaemia in this study, it is essential to perform routine screening for anaemia, promote health education and prompt treatment of HIV infections, which can reduce this burden. In addition, further study of risk factors for anaemia during pregnancy, including urban and rural communities, should be carried out to strengthen these findings.

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Conflicts of interest

There are no conflicts of interest.

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