Original Research Article

Prevalence and obstetric factors associated with anaemia among pregnant women, attending antenatal care in Unguja island, Tanzania

Mwanaisha M. Ali[1], Agatha F. Ngowi[2], Nyasiro S. Gibore[2]*

[1]Department of Obstetrics and gynecology, Kivunge Cottage Hospital Unguja, Ministry of Health Zanzibar, Zanzibar, Tanzania
[2]Department of Public Health, School of Medicine and Dentistry, College of Health Sciences, The University of Dodoma, Dodoma, Tanzania

*Correspondence:
Dr. Nyasiro S. Gibore,
E-mail: nyasiro2@gmail.com

ABSTRACT

Background: Anaemia in pregnancy remains a major health problem with adverse maternal and fetal outcome worldwide, especially in developing countries such as Tanzania. The study aimed to establish prevalence and obstetric factors associated with anaemia among pregnant women attending antenatal care visits in Unguja Island, Tanzania.

Methods: This cross sectional survey used systemic random sampling in three hospitals of Unguja Island to select 388 pregnant women. Demographic and obstetric characteristics of respondents were collected using a structured questionnaire. Hemoglobin levels were measured by using Hemocue machine. Multivariate logistic regression analysis was carried out in SPSS version 21.0 to measure obstetric factors associated with anaemia among pregnant women.

Results: The overall prevalence of anaemia among pregnant women was 80.8%, whereby 68.64% of respondents had mild anaemia, 11.24% had moderate anaemia and 0.89% had severe anaemia. The factors associated with anaemia in pregnancy were gravidity, (AOR= 1.185, 95% CI=0.317-4.338, p<0.001), irregular taking of iron tablets (AOR=0.288, 95% CI=0.149-0.556, p<0.001) and age of the child <2 years, (AOR 3.635, 95% CI= 1.103-11.882, p<0.034).

Conclusions: The prevalence of anaemia among pregnant women in Unguja is high. Timely and regular intake of iron tablets during pregnancy, child spacing as well as having children within the capacity of parents to raise them up may significantly reduce the prevalence of anaemia in pregnancy. Therefore health education on family planning and the importance of taking of iron tablet is critical.

Keywords: Anaemia, Maternal anaemia, Obstetric factors, Tanzania, Unguja

INTRODUCTION

Anaemia in pregnancy is the major global health problem especially in developing countries, where this fundamental health issue has not been solved. This problem affect the health, quality of life and working capacity in billions of people all over the world.[1] Globally, anaemia affects 1.62 billion people (24.8%) among which 56 million are pregnant women.[2] It is estimated that, half of the cases are due to iron deficiency anaemia.[3] The highest prevalence rate (61.3%) is found among pregnant women in Africa.[4] According to the Tanzania Demographic and Health Survey 2015-16 reports, 40% women in Mainland and 60% in Zanzibar are estimated to be anaemic.[5] The prevalence of anaemia differs in all trimester of pregnancy. For example, a study conducted by Rahmati estimated the prevalence of

anemia 19.6% in the first trimester, 10.1% in the second trimester and 16.1% in the third trimester of pregnancy.[6] Anaemia during pregnancy is considered when hemoglobin level is <110 g/dl before 12 weeks or <105 g/dl beyond 12 weeks gestation.[7]

Anaemia in pregnancy causes several effects on the mothers and fetus result into high maternal morbidity and mortality.[8] Anaemia is a leading cause of intrauterine growth retardation, preterm delivery, low birth weight and fetal death.[9] Among factors contributing to anaemia are nutrition such as iron deficiency, folic acid deficiency, vitamin B_{12} deficiency, a medical condition such as malaria in pregnancy, hookworm infection, bleeding disorder, and hereditary disorder such as thalassemia, and sickle cell haemoglobinopathy.[10] Another factors includes; socio-economic conditions, abnormal demands during pregnancy such as multiple pregnancies, teenage pregnancies, maternal illiteracy, short pregnancy intervals age of gestation, primigravida and multigravida.[11,12]

In Tanzania, different approaches are used to prevent pregnant women from anaemia such approaches includes; supplement of iron and ferrous during antenatal visit, health education about the important nutrient needed during pregnancy, mebendazole supplement on the second and third trimesters, supply of free insect side treated net to pregnant women and encourage them to use it. Despite all of the government's effort but the problem still exists which shows that various factors might be contributing to it. The aim of this study is to determine prevalence and obstetrics factors associated with anaemia among pregnant women in Unguja island, Tanzania.

METHODS

Study area

The study was conducted in three hospitals namely, Kivunge, Mwembeladu and Mnazimmoja hospital in Unguja Island. Zanzibar is part of the Republic of Tanzania in East Africa, it is approximately 25-50 kilometers off the cost. Tanzania mainland and it is comprised of two main islands Pemba and Unguja.[13] The capital city is Unguja. According to the Zanzibar census 2012, the total population of Zanzibar was 1,303,569. Females accounted for 672,892 and the remaining population is males.[13] Unguja's main economy comes from spices, raffia, and tourism. In particular, the islands produce cloves, nutmeg, and black pepper. The common diet consists of mainly cassava, bread and rice mixed with occasionally available vegetables and fish. There is irregular intake of meat due to poor availability and high cost. More than 98% of people in Zanzibar are Muslim and the remaining percentages are Christian and others.[13] The three hospitals are the only government institutions which provide ANC services to a larger number of pregnant women compared to other hospitals in Unguja.

The ANC service in these hospitals is provided by midwives who had got training on focused antenatal care.

Study design

Analytical cross-sectional design with quantitative approach was used in this study.

Study participants

The study participants for this study were pregnant women who were attending antenatal care at Kivunge, Mwembeladu and Mnazimmoja hospitals. Pregnant women who resided in Unguja for more than six months and who came for ANC during the time for data collection were included in the study. Pregnant women who were seriously ill during data collection were excluded in the study.
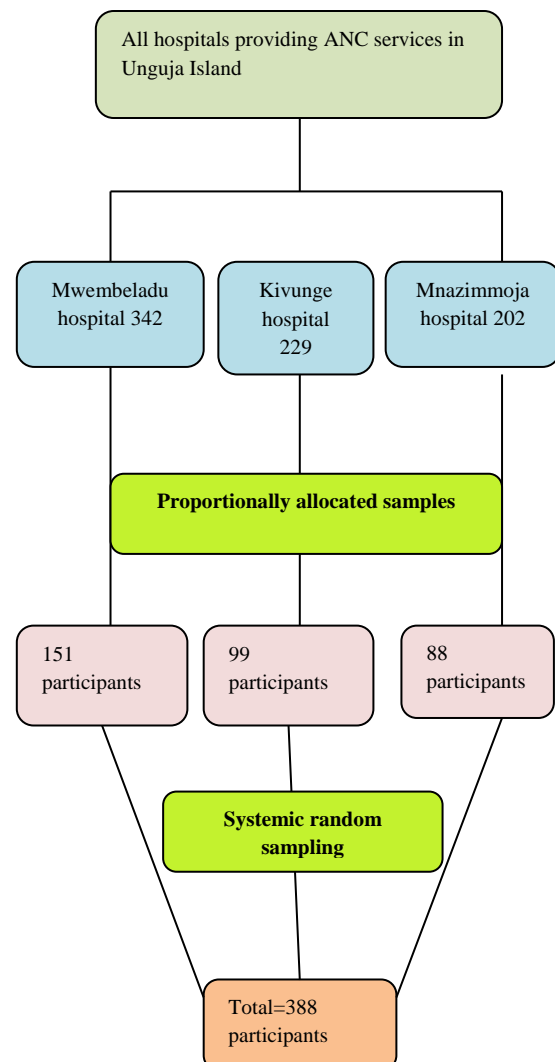
Figure 1: Sampling procedure in government hospitals providing ANC services in Unguja island.

Sample size and sampling procedure

The total sample size of 338 participants was obtained using proportion formula, assuming 27.8% proportion of anaemia in pregnancy (from previous study in Tanzania) at a 95% confidence limit, a 5% margin error and adding 10% as contingency for non-response.[14,15] After reviewing the records of monthly attendance of pregnant women for ANC visits in the three hospitals we found 342 attendees from Mwembeladu hospital, 229 from Kivunge hospital and 202 from Mnazimmoja hospital. The calculated sample size (338) was proportionally allocated to three hospitals based on the above records. Therefore 151 participants were selected from Mwembeladu hospital, 99 from Kivunge hospital and 88 from Mnazimmoja hospital. Systematic random sampling technique was used to select participants in each hospital. Sampling interval was obtained by taking the total monthly number of pregnant women who attended ANC in a particular hospital divided into the current allocated sample size. For instance in Mwembeladu hospital monthly attendees was 342, divide by current allocated sample size 151 which give the sampling interval of two. Then lottery method was employed to get the random start. The randomly selected starting point was number four. The interview started from the fourth pregnant mother, and then every two women were interviewed till the allocated sample was achieved. The same method was employed across the remaining hospitals (Figure 1).

Data collection technique and procedure

Questionnaire was prepared in English and translated into Kiswahili language. Before the actual data collection process, the pilot study was conducted with 34 pregnant women to observe whether the tools could be fit in obtaining information needed before indulging in the study. Semi structured questionnaire was used to obtain socio-demographic information and present and past obstetric history of pregnant women. Face to face interview was conducted by two research assistants. Both research assistants were midwifery nurses with diploma level who speak Kiswahili and were trained on data collection procedures for two days. The research assistants were regularly supervised for proper data collection. All the questionnaires were checked for completeness and consistency in daily basis.

Secondary data was collected by documental review of Reproductive and Child health card number 4.

Specimen collection and processing

The blood test of haemoglobin in the three hospitals was performed by the experts in this field. Each step of specimen collection, processing, and analysis was supervised by experienced and trained laboratory technologist supervisors. The qualified technician drew venous blood samples from pregnant women for the assessment of their anaemia. The reference values of haemoglobin were categorized according to the WHO criteria as: normal (11 g/dl or higher), mild (10–10.9 g/dl), and moderate (7–9.9 g/dl). Mild and moderate levels (<11 g/dl) of haemoglobin were defined as anaemic.[16] After following all aseptic precautions, 2 mg/l EDTA (ethylenediaminetetraacetic acid) vial was collected from the antecubital vein using a disposable plastic syringe. The vial was labelled with identification number before centrifugation. Serum was separated by centrifugation (10 minutes) at a rate of 2000 rpm at room temperature; immediately after that blood was allowed to clotting for 30 minutes. Separated serum was allocated in different eppendrof for haemoglobin test. Lastly the result was read by using Colorimetric method for the measurement of haemoglobin concentration.

Data analysis

The Statistical Packages for Social Science (SPSS) version 21), was used for both data entry and analysis. Descriptive statistics was used to analyze demographic characteristic and presented by using frequency, percentage, tables and figures. Inferential statistics was done by cross-tabulation to find the relationship between independent and dependent variables. Multivariate logistic regression was done to control for confounding effects. The strength of association was estimated in odds ratio, p value and its 95% confidence interval

RESULTS

Demographic characteristics of the study respondents

A total of 338 pregnant women participate in the study. The mean age of respondents was 28 years. The minimum and maximum age was 18 and 45 years respectively. More than half (59.8%) of the respondents belonged to the age group of 20 to 30 years Majority (88.46%) of the respondents were from the urban area. About 98.81% were married. Majority (85.21%) of respondents were unemployed. Most (96.15%) of the respondents had a formal education (Table 1).

Overall prevalence of anemia and its severity

The results of this study showed that out of 338 participants, 273 (80.77%) were found to be anaemic. Among those who were anaemic, 68.64% had mild anaemia, 11.24% had moderate anaemia and 0.89% had severe anaemia (Table 2).

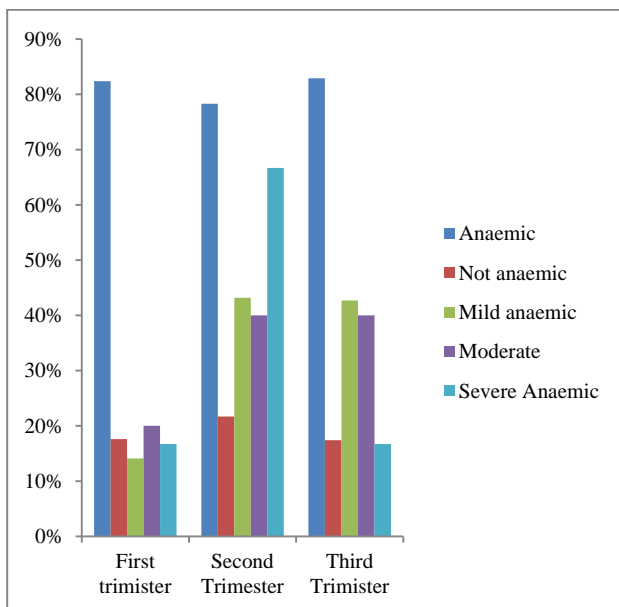### Prevalence of anaemia according to gestational age

Figure 2, below shows that, there were no much differences in prevalence of anaemia across the semesters, 82.4%, 78.3 % and 82.9% in first, second and third trimester respectively. However, more than half (66.7%) of pregnant women in the second trimester had severe anaemia.

Table1: Social demographic characteristics of the respondents (N=338).

Variable	N	%
Age (in years)		
<20	2 9	8.6
20-30	202	59.8
>30	107	31.7
Residence		
Urban	299	88.46
Rural	39	11.54
Marital status		
Married	334	98.81
Un married	4	1.18
Occupation status		
Employed	50	14.79
Unemployed	288	85.21
Education level		
Not formal	13	3.84
Formal	325	96.15

Table 2: Overall prevalence of anaemia and its severity among pregnant women.

Variable	N	%
Overall prevalence of anaemia		
Anaemic	273	80.77
Not anaemia	65	19.23
Anemia according to severity		
Normal	65	19.23
Mild	232	68. 64
Moderate	38	11.24
Severe	3	0.89

Figure 2: Prevalence of anaemia according to gestational age.

Table 3: Obstetric characteristics of study respondents (N=338).

Variables	Variable categories	N	%
Gestational age	First trimester	26	7.7
	Second trimester	163	48.2
	Third trimester	149	44.1
Gravidity	Primigravida	93	27.5
	Multigravida	245	72.5
Parity	None	89	26.3
	<2	85	25.2
	≥2	164	48.5
Birth interval	Not had a child	90	26.62
	<2 year	139	41.12
	>2 years	109	32.24
ANC visits	1-3 visits	288	79.3
	4-7 visits	70	20.7
Illness during pregnancy			
Malaria	Yes	4	1.2
	No	334	98.8
Iron supplement	Yes	132	20.0
	No	206	80.0

Table 4: Relationship between obstetric factors of the study respondents and anaemia (N=338).

Variable	Anaemic, n (%)	Non anaemic, n (%)	x^2	P value
Taking of iron tablet				
Yes	121 (44.3)	152 (55.7)	13.033	0.001*
No	45 (69.2)	20 (30.8)		
Birth interval				
No child	75 (27.5)	15 (23.1)	15.756	0.001*
<2	123 (45.1)	16 (24.6)		
>2	75 (27.5)	34 (52.3)		
ANC visit				
1-3	71 (26.01)	202 (73.99)	1.0520	0.3051
4-7	21 (32.31)	44 (67.69)		
Gravida				
Prime	94 (34.4)	37 (56.9)	11.188	0.001*
Multi-gravida	179 (65.9)	28 (43.1)		
Parity				
Once	243 (76.9)	73 (23.1)	0.200	0.655
≥2	16 (72.7)	6 (27.3)		

*Statistically significant at p<0.001.

Obstetric characteristics of study respondents

Table 3, below shows that nearly half (48.2%) of pregnant women were in the second trimester of pregnancy. About 72.5% of participants were multigravida. Nearly half (48.5%) of respondents had given birth more than two times. Regarding birth interval, one hundred thirty nine (41.12%) of pregnant women had birth interval of less than two years. Additionally the study findings have revealed that majority (79.3%) of pregnant women had 1-3 antenatal visits. On the other hand, findings showed that most (98.8%) of pregnant women had no history of malaria attack in their current pregnant period.

Relationship between obstetric factors and anaemia

Table 4 below shows the relationship between obstetric factors and anaemia among pregnant women, A cross tabulation was done and findings showed that there was a relationship between taking of iron tablet (x^2=13.033,

p<0.001), birth interval (x^2=15.756, p<0.001), gravidity (x^2=11.118, p<0.001) and anaemia.

Logistic regression analysis on obstetric factors associated with anaemia

Binary logistic regression was conducted and after controlling for confounder in multivariate analysis, the variable taking of iron tablets, birth interval and gravidity remained significantly associated with anaemia. Respondents who had history of taking iron tablets were less likely to get anaemia compared to respondents who did not take iron tablets (AOR=0.288, 95% CI=0.149-0.556, p<0.001). Respondents who had birth interval of less than two years were 3 times more likely to have anaemia compared to respondents with birth interval of two or more than two years (AOR=3.835,95% CI =1.103-11.882, P<0.034). Multigravida women were likely to get anaemia compared to primegravida women (AOR=1.185, 95% CI= 0.317-4.438, p<0.001) (Table 5).

Table 5: Association between obstetric factors of the study respondents and anaemia (N=338).

Variables	OR	CI (95%)		P-value	AOR	CI (95%)		P- value
		Lower	Upper			Lower	Upper	
Taking of iron tablet								
No	Ref							
Yes	2.354	0.198	0.631	0.001	0.288	0.149	0.556	0.000***
Birth interval								
No child	Ref							
>2years	0.650	0.300	1.392	0.001	1.389	0.370	5.222	0.627
<2years	2.267	1.141	4.504	0.020	3.635	1.103	11.882	0.034*
Gravidity								
Prime	Ref							
Multigravida	2.516	1.451	4.365	0.001	1.185	0.317	4.438	0.001***

Statistically significant at *p<0.05, ***p<0.001.

DISCUSSION

The overall prevalence of anaemia in this study was 80.8%, however, more than half (60.65%), of the respondents had mild anaemia, 11.24% had moderate and 0.89% had severe anaemia. The prevalence of anaemia in this study is higher than a study conducted in Ethiopia, Indian and Morocco, which showed that prevalence of anaemia were 27.6%, 41.5% and 57.6% respectively.[17-19] The difference observed in these studies could be due to geographical factors and difference in nutrition practices among pregnant women. The prevalence of anaemia in this study is also higher than the national anaemia prevalence of 48% and 60% in Zanzibar.[20] and higher than the study conducted in northern part of Tanzania which found the prevalence of 47.4%.[21] This may be explained in the fact that the living standard of majority of people in Zanzibar is poor.[22] The large part of the population in Zanzibar is clustered around the poverty line that could easily fall back into poverty.[22] This may

hinder pregnant women from consuming quality and quantity food. Their typical diet consists of mainly cassava, bread and rice mixed with seasonally-available vegetables and fish; there is infrequent intake of meat due to poor availability and high cost.[23] The main sources of iron obtain from those foods is non-heme iron with bioavailability of not more than 10%. Another possible explanation for the variation in the prevalence among these two studies could be the time gap between the current study and the 2015-16 Tanzania demographic and health survey and malaria indicator survey. It may be household living standards has changes with time.

The current study has shown the prevalence of anaemia varies during pregnancy. It was found that 82.4% pregnant women had anaemia in the first trimester, 78.3% in the second trimester and 82.9% in the third trimester while 66.7% had severe anaemia in the second trimester. The prevalence of anaemia observed in this study, has reflected the change of haemoglobin value during pregnancy due to an increase demand of the body and

physiological changes.[3] Finding in this study is also similar to a study conducted in Iran which showed that the prevalence of anaemia varies during pregnancy by 5% in the first trimester, 3.4% in the second and 8.7% in the third trimester.[24] The similarities observed in these findings could be due to the increase demand of the baby during late pregnancy coupled with low socioeconomic status of the women, seasonal, dietary and behavioral variations which can have an effect on their nutritional status as well as health seeking behavior. Furthermore, the study differ with a study conducted in Ethiopia which showed, that the prevalence of anaemia in the first trimester was 6.12%, second trimester 28.57% and third trimester 65.3%.[25] This difference could be due to the reason that pregnant women's booking time for ANC was late in the current study. Most of them started attending their first ANC visit at 20 weeks of gestation. Late booking for ANC may interfere with adherence to ferrous and folic acid supplement as well as deworming especially if they cannot access these services from ANC. Late booking for ANC, poor adherence to iron supplementation and deworming may play a role for the observed differences in prevalence of anaemia among pregnant women in these two studies.

The current study shows that, pregnant women whom were not taking iron tablets regularly were 2 times more likely to have anaemia when compared to those whom were taking iron tablets. This could be due to the fact that the requirement for iron increases during pregnancy for the growing fetus and placenta, the blood volume of pregnant woman decreases by 50% during this period as a result, supplementation of iron during pregnancy is critical to fulfil this requirement.[26] The finding of this study is in agreement with other previous studies conducted in Ethiopia, Uganda, Nigeria, Vietnam and Pakistan which pointed out that lack of iron supplementation is amongst the most significant risk factors for developing anaemia in pregnant women.[27-31] Thus, this give the impression that the most effective intervention to reduce the prevalence of anemia among pregnant women is education in the proper use of iron and folic acid supplements as well as proper nutrition which contain iron-rich food sources.

In this study, the results show that, multigravida women were two times more likely to get anaemia when compared to primigravida women. This could be due to the reason that the increase in number of pregnancy and physical changes during pregnancy increases the susceptibility of getting repeated haemorrhage during delivery and maternal nutrition depletion.[24] Also hormonal changes during pregnancy leads to increase in plasma volume, which causes a reduction of haemoglobin level.[24] The finding of this study agree with other previous studies conducted in Nigeria, Pakistan, India and Ethiopia, which found that multigravida women were more likely to get anaemia compared to primigravida women.[29,31-34] The finding of this study is in contrast with other studies conducted in Zambia and Nigeria which

reports that primigravida women were more likely to get anaemia when compared to multigravida women respectively.[35,36]

The current study has found that pregnant women who had birth interval of less than two years were three times more likely to have anaemia compared to those with birth interval of more than two years. This might be related with decreased iron store of women due to occurrence of pregnancy in rapid sequence between subsequent pregnancies while during this period the requirements are substantially higher than the average. This finding is consistent with other studies conducted in India, Ethiopia, Nigeria and Saudi Arabia, which found that pregnant women with less interval than 2 years spacing between previous and index pregnancy were more likely to get anaemia.[26,29,37-39] Therefore, intervention focusing on birth intervals could be appropriate in order to reduce the prevalence of anaemia among pregnant women.

CONCLUSION

Based on the findings of this study, we conclude that anaemia is alarmingly high among pregnant women and is significantly associated with parity, birth interval and iron supplementation. The study recommends awareness creation on birth interval and iron supplementation as well as nutritional counselling on consumption of iron-rich foods to prevent anaemia among pregnant women in Unguja Island.

ACKNOWLEDGEMENTS

REFERENCES

1. World Health Organization. Guideline: Daily iron and folic acid supplementation in pregnant women, 2012. Available at http://www.who.int/nutrition/publications/micronutrients/guidelines/daily_ifa_supp_pregnant_women/en/. Accessed 9 August 2018.
2. Barooti E, Rezazadehkermani M, Sadeghirad B, Motaghipisheh S, Arabi M, Salahi S, et al. Prevalence of iron deficiency anemia among Iranian

pregnant women; a systematic review and meta-analysis. J Reprod Infertil. 2010;11(1):17.

3. Ghimire N, Pandey N. Knowledge and practice of mother regarding the prevention of anaemia during pregnancy, in teaching hospital, Kathmandu. J Chitwan Med Coll. 2013; 3(5):14-7.

4. Gebre A, Mulugeta A. Prevalence of anemia and associated factors among pregnant women in North Western zone of Tigray, Northern Ethiopia: a cross-sectional study. J Nutr Metab. 2015;2015:165430.

5. Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), [Tanzania Mainland, Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS) and ICF. 2015-16 Tanzania Demographic and Health Survey-Malaria Indicator Survey Key Findings. Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF. 2016.

6. Rahmati SH, Delpisheh A, Parizad N, Sayehmiri K. Maternal Anemia and Pregnancy outcomes: a Systematic Review and Meta-Analysis. International J Pediatrics. 2016;4(8):3323-42.

7. World Health Organization. Haemoglobin Concentrations for the diagnosis of anaemia and assessment of severity. Available at: http://www.who.int/vmnis/indicators/haemoglobin.pdf?ua=1. Accessed on 04 Feb, 2018.

8. Sharma JB, Shankar M. Anemia in Pregnancy. JIMSA. 2010;23(4):253-60.

9. Hassan AA, Mamman AI, Adaji S, Musa B, Kene S. Anemia and iron deficiency in pregnant women in Zaria, Nigeria. Sub-Saharan Afr J Med. 2014;1:36-9.

10. Dutta DC. Anaemia in pregnancy. Text book of Obstetrics including Perinatology & Contraception, 8th edition ISBN: 978-93-5152-723-7. New Delhi, India: Jaypee Brothers Medical Publishers (P) Ltd; 2015.

11. Haniff J, Das A, Onn LT, Sun CW, Nordin NM. Anaemia in pregnancy in Malaysia: A cross-sectional survey. Asia Pac J Clin Nutr. 2007;16:527-36.

12. Noronha JA, Bhaduri A, Vinod Bhat H, Kamath A. Maternal risk factors and anaemia in pregnancy: A prospective retrospective cohort study. J Obstet Gynaecol. 2010;30:132-6.

13. National Bureau of Statistics. The 2012 population and housing census for the United Republic of Tanzania. September, 2013.

14. Loy SL, Marhazlina M, Nor Azwany Y, Hamid Jan JM. Development , Validity and Reproducibility of a Food Frequency Questionnaire in Pregnancy for the Universiti Sains Malaysia Birth Cohort Study. Mal J Nutr. 2011;17(1):1-18.

15. Hinderaker SG, Olsen BE, Bergsjø P, Lie RT, Gasheka P, Kvåle G. Anemia in pregnancy in the highlands of Tanzania. Acta Obstet Gynecol Scand. 2001;80(1):21.

16. WHO, UNICEF, UNU. Iron deficiency anaemia: assessment, prevention and control, a guide for programme managers. Geneva: World Health Organization; 2001. Available at: http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/WHO_NHD_01.3/en/index.html. Accessed on 13 April, 2018.

17. Getahun W, Belachew T, Wolide AD. Burden and associated factors of anemia among pregnant women attending antenatal care in southern Ethiopia : cross sectional study. BMC Res Notes. 2017;10:276.

18. Abiselvi A, Gopalakrishnan S, Umedevi R, Rama R. Socio-demographic and obstetric risk factors of anaemia among pregnant women in rural Tamil Nandu. Int J community Med Public Health. 2018;5:721-7.

19. Hasswane N, Bouziane A, Mrabet M, Laamiri FZ, Aguenaou H, Barkat A. Preva-lence and Factors Associated with Anemia Pregnancy in a Group of Moroccan Pregnant Women. J Biosci Med. 2015;3:88-97.

20. Ministry of Health, Community Development, Gender, Elderly and Children: 2015-16 TDHS-MIS Key Findings. [Tanzania Mainland, Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS) and ICF. 2016. Rockville, Maryland, USA, 2016.

21. Msuya SE, Hussein TH, Uriyo J, Sam NE, Stray-Pedersen B. Anaemia among pregnant women in northern Tanzania: prevalence, risk factors and effect on perinatal outcomes. Tanzan J Health Res. 2011;3(1):33-9.

22. Belghith N, Belhaj H, De Boisseson, Pierre-Marie A. Zanzibar poverty assessment. 2017. Washington, D.C.: World Bank Group. Available at: http://documents.worldbank.org/curated/en/778051509021699937/Zanzibar-poverty-assessment. Accessed on 22 February 2018.

23. Stoltzfus RJ, Chwaya HM, Montresor A, Albonico M, Savioli L, Tielsch JM. Malaria, hookworms and recent fever are related to anemia and iron status indicators in 0- to 5-years old Zanzibari children and these relationships change with age. J Nutr. 2000;130:1724-33.

24. Mirzaie F, Eftekhari N, Goldozeian S, Mahdavinia J. Prevalence of anemia risk factors in pregnant women in Kerman, Iran. IJRM. 2010;8(2):66–9.

25. Bizuneh A, Befekadu A. Assessment of Prevalence and Risk Factors for Anemia Among Pregnant Mothers Attending Anc Clinic at Adama Hospital Medical Collage, Adama, Ethiopia, 2017. J Gynecology Obstetrics. 2018;6(3):31-39.

26. Bekele A, Tilahun M, Mekuria A. Prevalence of Anemia and Its Associated Factors among Pregnant Women Attending Antenatal Care in Health Institutions of Arba Minch Town, Gamo Gofa Zone, Ethiopia: A Cross-Sectional Study. Anemia. 2016;1-9.

27. Abel G, Afework M. Prevalence of Anemia and Associated Factors among Pregnant Women in North Western Zone of Tigray, Northern Ethiopia: A Cross-Sectional Study. J Nutr Metab. 2015;2015:1-7.
28. Sam O, Oona C, Florence M. Haemoglobin status and predictors of anaemia among pregnant women in Mpigi, Uganda. BMC Res Notes. 2014;7:712.
29. Nwizu EN, Iliyasu Z, Ibrahim SA, Galadanci HS. Socio-Demographic and Maternal Factors in Anaemia in Pregnancy at Booking in Kano, Northern Nigeria. Afr J Reprod Health. 2011;15(4):33-41.
30. Vivek RG, Halappanavar AB, Vivek PR, Halki SB, Maled VS, Deshpande PS. Prevalence of Anaemia and its epidemiological Determinants in Pregnant Women. AJMS. 2012;5(3):216–23.
31. Khan DA, Fatima S, Imran R, Khan FA. Iron, folate and cobalamin deficiency in anaemic pregnant females in tertiary care centre at Rawalpindi. J Ayub Med College Abbottabad. 2010;22(1):17–21.
32. Anuragamayi Y, Kumari K. Prevalence and Risk Factors of Anemia among Pregnant Women Attending a High-Volume Tertiary Care Center for Delivery. IOSR J Dental Med Sci. 2017;16(12):56–60.
33. Mangla M, Singla D. Prevalence of anaemia among pregnant women in rural India : a longitudinal observational study. IJRCOG. 2016;5(10):3500–5.
34. Bereka SG, Gudeta AN, Reta MA, Ayana LA. Prevalence and Associated Risk Factors of Anemia among Pregnant Women in Rural Part of JigJiga City , Eastern Ethiopia : A Cross Sectional Study. J Pregnancy Child Health. 2017;4(337).
35. Lubeya M K, Walika B V. Anaemia in Pregnancy among Pregnant Women in Lusaka District, Zambia. Medical J Zambia. 2017;44(4):238–43.
36. Chikwendu MC, Nkemena B, Udigwe GO, Obiechina NJA, Nnaji GA. Risk factors for anaemia in pregnancy at the first antenatal clinic visit at Nnamdi Azikiwe university teaching hospital, Nnewi. Tropical J Obstetrics Gynaecol. 2015;32(1).
37. Tomar GS, Singhal S, Shukla Al. Anemia in pregnancy : Epidemiology and it's determinants. Int J Med Health Res. 2017;3(1):5-9.
38. Kassa GM, Muche AA, Berhe AK, Fekadu G A. Prevalence and determinants of anemia among pregnant women in Ethiopia ; a systematic review and meta-analysis. BMC Hematol. 2017;17(17).
39. Abdelhafez AM, El-Soadaa SS. Prevalence and risk factors of anemia among a sample of pregnant females attending primary health care centers in Makkah, Saudi Arabia. Pak J Nutr. 2012;11(12):1113–20.

Cite this article as: Ali MM, Ngowi AF, Gibore NS. Prevalence and obstetric factors associated with anaemia among pregnant women, attending antenatal care in Unguja island, Tanzania. Int J Community Med Public Health 2019;6:950-7.