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Routine uptake of prenatal iron-folic acid supplementation and associated factors among pregnant women in peri-urban areas of Dodoma City, Tanzania: a cross-sectional study

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Abstract

Background The physiological requirements for iron and folic acid in pregnancy are a significant challenge to achieve through normal dietary intake, especially in low resource settings. The World Health Organization recommends daily oral iron and folic acid supplementation (IFAS) to prevent maternal anaemia and related adverse effects in community settings where the prevalence of anaemia during pregnancy is > 40%. The objective of this study was to assess the routine uptake of prenatal iron-folic acid supplementation and associated factors among pregnant women at peri-urban areas of Dodoma City, Tanzania.

Methods A cross-sectional study was conducted in peri-urban areas. Data was collected through face-to-face interviews and review of records from maternal clinic card (RCH 4 card). Routine uptake of iron-folic acid supplementation was defined as pregnant woman who reported taking iron-folic acid supplements at least once within the past seven days prior to data collection. Frequency and percentage were used to report respondents' characteristics and uptake of prenatal iron-folic acid supplementation. Chi-square test and logistic regression were conducted to determine the relationship and association of routine uptake of iron-folic acid supplementation with respondents' characteristics.

Results The total respondents were 452. Overall routine uptake of iron-folic acid supplementation was 35.6% (161). The majority of the respondents (66.5%) initiated iron-folic acid supplementation during the second trimester of pregnancy. Most of the respondents (86.3%) obtained IFA supplements at the health centers where they were receiving antenatal care. The prevalence of routine uptake of iron-folic acid supplementation was significantly higher among women in the third trimester of pregnancy (54.9%), those with more than a five-year interval since last pregnancy (40.6%), those with at least four antenatal care (ANC) visits (73.7%) and women who had undergone

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haemoglobin testing in the current pregnancy (63.0%). Factors associated with routine uptake of iron-folic acid supplementation were; frequency of ANC visits (AOR = 1.69) and haemoglobin testing (AOR = 3.02).

Conclusion Approximately one third of the pregnant women took iron-folic acid supplementation at least once a week. The current frequency for intake of iron-folic acid supplementation can be described as intermittent. This practise is unacceptable for prevention of maternal anaemia and associated adverse pregnant outcomes. Frequency of ANC visits and haemoglobin testing during pregnancy were found to be associated with routine uptake of iron-folic acid supplements. Stakeholders are urged to consider novel systems for provision of prenatal IFAS in community settings with limited access to health-care professionals to ensure a timely and continuous supply of supplements.

Keywords Iron, Folic acid, Supplementation, Pregnancy, Antenatal care visit, Haemoglobin, Anaemia.

Introduction

Iron and folic acid (IFA) are vital micronutrients for normal physiological function of the body and general life maintenance [1, 2] for all people. The recommended dietary allowances (RDA) for IFA can be met through a well-balanced diet for most people, with the exception of women of reproductive age, children under five children and pregnant women. During pregnancy the RDA for IFA almost doubles from the usual requirements which necessitate IFA supplementation (IFAS) to meet the body's physiological needs [2]. Previous scholars have demonstrated that, nutritional intervention with iron supplementation during pregnancy helps improve haemoglobin levels and reduces iron deficiency anaemia [3–5], especially in settings where prevalence of anaemia in pregnancy is a public health problem (>40%). Anaemia during pregnancy has negative effects on maternal and child health including; increased maternal and perinatal mortality, including increased numbers of preterm births and/or low birth weight [6–8], impaired cognitive development in children [9] and intrauterine growth retardation [10].

The World Health Organization (WHO) compiled guidelines for prenatal IFAS as a key strategy to prevent the adverse effects of anaemia during pregnancy [1, 7]. The guidelines state that every pregnant woman living in areas where anaemia is a public health problem (prevalence 40% or higher) should take prenatal IFAS on daily basis throughout pregnancy and continue for three months postpartum [2]. Tanzania is among the countries with high prevalence of anaemia during pregnancy (56%)[11] and the prevalence varies across the country. For instance, the prevalence of anaemia during pregnancy in five different regions of Kilimanayaro [6], Mbeya [11], Dodoma [12], Dar es Salaam [13] and Unguja [14] is reported to range from 18.0 to 80.8%. As a developing country, Tanzania has adopted the WHO guidelines for prenatal IFAS during pregnancy and incorporated it into local antenatal care guidelines. The Tanzania antenatal guidelines state that, every pregnant woman should receive 200 mg of ferrous sulphate and 0.4 mg of folic acid daily throughout pregnancy [15]. The supplements are dispensed when the pregnant woman attends her first antenatal care (ANC) visit and continues during subsequent regular visits throughout the pregnancy [15]. During ANC, the IFA supplements are provided free of charge on a monthly basis in all healthcare facilities.

Adherence to intake of prenatal IFAS is important to promote favourable maternal, foetal and neonatal outcomes [7]. There is limited information regarding uptake of prenatal IFAS and associated factors especially in local settings [16]. The existing evidence from national surveys are based on the regional level with pool of data from urban, peri-urban and rural settings. In contrast, this study aimed to assess the prevalence and factors associated with routine uptake of prenatal IFAS among pregnant women in peri-urban areas of Dodoma City, Tanzania.

Methods

Study design and population

This study was a cross-sectional survey conducted from August to December, 2020 in four peri-urban wards of Dodoma City. The eligible population included all pregnant women who pregnancies had been confirmed by a nurse or nurse midwife.

Study setting

Dodoma City is the capital of Dodoma Region and the home of national capital of Tanzania. This study was conducted in peri-urban areas of Dodoma City. The peri-urban areas are inhabited by local populations; mainly the Gogo, Rangi and Sandawe tribes [17]. The main economic activities include small retail businesses, seasonal agriculture that depend on unimodal rainfall and agro-pastoral activities. The main staple foods grown are maize, sorghum, millet, sunflower and nuts [17]. Livestock such as cattle, goat and chickens are also raised and marketed within the locality [18, 19].

According to the information available from Regional Medical Officer's office in May of 2020, the city had a total eighty-four health facilities which included 66 dispensaries, 11 health centres and 7 hospitals. Maternal health care services are provided in all health care

facilities within the city. However, in peri-urban areas maternal and child health care services are mostly provided through outreach programmes, usually on a monthly routine basis.

Sample size and sampling procedure

The sample size (N) for this study was calculated using the formula $n = z^2 p\frac{1-p}{e^2}$ whereby: n=sample size, z=1.96, e=5%, and p=27.2% (prevalence of iron and folic acid compliance in Dodoma) [20]. 10% attrition rate was considered to compute the required minimum sample size of 338 respondents.

Simple random sampling was used to select four out of fifteen peri-urban wards for the study. Household with pregnant woman was identified with the help of a local leader and community health worker. The identified pregnant woman was invited to participate in the study at the nearest health care facility or site prepared for the research, usually the same locations commonly used during monthly outreach health services. Pregnant woman who had attended antenatal care visits during the pregnancy, was asked to come with her RCH 4 card. Upon arrival at the research site, the respondents received their usual care with local nurse or nurse midwife who performed all the required assessments per antenatal care guidelines. For those who were attending for the first time, an assessment was performed to confirm the pregnancy with details recorded by the local nurse or midwife in her new RCH 4 card. All pregnant women who showed-up in response to the invitation were included in the study. After the interview, each woman was given a one-month dosage of prenatal IFA supplements.

Data collection procedures

Data was collected using a pre-tested semi-structured questionnaire adapted and modified from the Tanzania Demographic and Health Survey questionnaire [16]. The modifications made to the questionnaire included: language translation to fit the audiences, length adjustment by removing questions unrelated to the current study, screening and removal of sensitive questions with no bearing on the study. Respondent's socio-demographic characteristics was obtained through face-to-face interviews. Obstetric details and haemoglobin testing status were obtained through review of previous records from RCH 4 card.

Data processing and analysis

Data was coded, cleaned and transformed by using the SPSS version 22 for WINDOWS computer program (SPSS Inc. Chicago). Descriptive analysis was carried out to present frequency distributions for socio-demographic and obstetric characteristics. Chi-square test for independence was conducted to study the relationship between routine uptake of prenatal IFAS versus respondents' characteristics. All independent variables with p-value less than 0.25 were considered for the multivariable logistic regression analysis to determine the associates of routine uptake of prenatal IFAS. Thereafter, multivariable logistic regressions were conducted to determine the associates of routine uptake of prenatal IFAS. All probabilities were two-tailed and independent variables with p values < 0.05 were regarded as significant. Routine uptake of prenatal IFAS was defined as intake of prenatal IFA supplement at least once within seven days prior to data collection.

Results

Socio-demographic and maternal characteristics of the respondents

A total of 452 out of 475 invited pregnant women participated in this study (95.2% response rate). The mean age of respondents was 25.08(±6.80 SD) years. The majority of the respondents 361 (79.9%) were from the Gogo tribe. Two hundred and eighty-seven (63.5%) respondents had completed primary level education. Of the 452 respondents, 86.3% (390) were currently married; 71.5% (323) were engaged in peasantry activities as major income generating activities and approximately two third (66.6%) reported to have a health care facility within five kilometres of their home (see Table 1).

More than 2/3 of the respondents (64.2%) were multigravida, 252 (55.5%) had five years interval between the last and current pregnancy and 63.3% had attended 1 to 3 ANC visits. Three hundred and six (67.7%) of the respondents had received lab screening for anaemia during the current pregnancy (see Table 2).

Uptake of prenatal IFAS among pregnant women in peri-urban areas, Dodoma City (N=452).

Data was recorded for a total of 452 women. One hundred and sixty-one (35.6%) took prenatal IFAS at least once within last seven days and among them 83 (51.6%) took supplement the previous day prior to data collection. The majority of respondents 139/161 (86.3%) obtained the prenatal IFAS from the antenatal clinic. One hundred and seven 107 (66.5%) respondents started uptake of prenatal IFAS during the second trimester of pregnancy at an average gestational age of 16.92(±6.16SD) weeks. Women reported a range of reasons for not taking prenatal IFAS the previous day; including not having the supplement (n=58, 74.4%), having forgotten (n=11, 14.1%) and adverse side effects from the supplement (n=6, 7.6%) (see Table 3).

Table 1 Routine uptake of prenatal IFAS according to socio-demographic characteristics among pregnant women in peri-urban, Dodoma City (*N* = 452)

Socio-demographic characteristics	Total *n* (%)	Uptake of prenatal IFAS		
		Yes - *n* (%)	No - *n* (%)	*p*-value
Age (years)				
15–19	109 (24.1)	42 (38.5)	67 (61.5)	0.505
20–29	227 (50.2)	84 (37.0)	143 (63.0)	
30–39	96 (21.2)	28 (29.2)	68 (70.8)	
40–49	20 (4.4)	7 (35.0)	13 (65.0)	
Tribe				
Gogo	361 (79.9)	122 (33.8)	239 (66.2)	0.313
Others	91 (20.1)	39 (42.9)	52 (57.1)	
Highest education level attained				
No formal	97 (21.5)	38 (39.2)	59 (60.8)	0.562
Primary	287 (63.5)	97 (33.8)	190 (66.2)	
Secondary	68 (15.0)	26 (38.2)	42 (61.8)	
Current marital status				
Married	390 (86.3)	135 (34.6)	255 (65.4)	0.318
Not married	62 (13.7)	26 (41.9)	36 (58.1)	
Major income generating activity				
Employment	87 (19.2)	30 (34.5)	57 (65.5)	0.274
Peasantry	323 (71.5)	110 (34.1)	213 (65.9)	
None	42 (9.3)	21 (50.0)	21 (50.0)	
Distance to the health care facility (Km)				
≤ 5	301 (66.6)	112 (37.2)	189 (62.8)	0.349
> 5	151 (33.4)	49 (32.5)	102 (67.5)	

Routine uptake of iron–folic acid supplementation according to selected socio-demographic and maternal characteristics

The chi-square test for independence was conducted to compare the respondents' selected socio-demographic and maternal related characteristics with the routine uptake of prenatal IFAS (see Tables 1 and 2). Routine uptake of prenatal IFAS differed significantly by gestational age, number of years since last pregnancy, number of ANC visits and haemoglobin testing status ($p < 0.05$). The routine uptake of prenatal IFAS was significantly higher among the respondents in third trimester (54.9%), those with the interval of more than 5 years since last pregnancy (40.6%), those with 4 or more ANC visits (73.7%) and those who had undergone haemoglobin testing during the current pregnancy (63.0%) (see Table 2).

Factors associated with routine uptake of iron-folic acid supplementation among pregnant women in peri-urban, Dodoma City

All independent variables with p -value of <0.25 from chi-square test analysis were fitted into a multivariable logistic model to determine the associates of routine uptake of prenatal IFAS. After adjusting for the potential confounders, only two factors were found to be significantly associated with routine uptake of prenatal IFAS. These included the number of ANC visits and haemoglobin testing status. The odds of routine uptake of IFAS was increasing per every unit increase of number of ANC visits. Unit increase in number of ANC visits was associated with 1.69 odds of routine uptake of IFAS (AOR = 1.69 (95% CI 1.35, 2.13). Respondents who had undergone haemoglobin testing had 3.02 odds of routine uptake of IFAS (AOR = 3.02 (95% CI 1.86, 4.89) compared with those without haemoglobin level tested (see Table 4).

Discussion

This study found that only one-third of the respondents had taken prenatal IFA supplements at least once within seven days prior to data collection. The current uptake of prenatal IFAS can be best described as intermittent. The intermittent intake of 200 mg of ferrous sulphate and 0.4 mg of folic acid is considered to be very low for the prevention of maternal anaemia and its associated adverse outcomes in settings where maternal anaemia is a significant public health problem [7]. The WHO recommends daily oral iron and folic acid supplementation with 30 mg to 60 mg of elemental iron and 400 g (0.4 mg) of folic acid for prevention of maternal anaemia in settings with high prevalence of maternal anaemia (>40%)[7]. Therefore, the low proportion of pregnant women who reported taking prenatal IFAS in this study highlights the concern that there are high numbers of pregnant Tanzanian women without adequate adherence to IFAS during pregnancy. A similar finding has been demonstrated in Tanzania Demographic and Health Survey report which

Table 2 Routine uptake of prenatal IFAS according to selected maternal characteristics among pregnant women in peri-urban, Dodoma City (*N* = 452)

Maternal characteristics	Total	Uptake of prenatal IFAS		
	n (%)	Yes - *n* (%)	No - *n* (%)	*P* – value
Gestational age				
First trimester	60 (13.3)	8 (13.3)	52 (86.7)	0.000
Second trimester	199 (44.0)	47 (23.6)	152 (76.4)	
Third trimester	193 (42.7)	106 (54.9)	87 (45.1)	
Gravidity				
Prime gravida	162 (35.8)	64 (39.5)	98 (60.5)	0.197
Multi gravida	290 (64.2)	97 (33.4)	193 (66.6)	
Parity				
Nullipara	167 (36.9)	65 (38.9)	102 (61.1)	0.052
Primiparous	102 (22.6)	44 (43.1)	58 (56.9)	
Multiparous	149 (33.0)	41 (27.5)	108 (72.5)	
Grand multiparous	34 (7.5)	11 (33.4)	23 (67.6)	
History of either abortion or miscarriage or stillbirth since last child				
No	406 (89.8)	147 (36.2)	259 (63.8)	0.438
Yes	46 (10.2)	14 (30.4)	32 (69.6)	
Interval since last pregnant (years)				
≤ 3	99 (21.9)	26 (26.3)	73 (73.7)	0.030
3.1–5.0	102 (22.6)	33 (32.4)	69 (67.6)	
≥ 5.1	252 (55.5)	103 (40.6)	149 (59.4)	
Previous number of ANC visits				
0	128 (28.3)	2 (1.6)	126 (98.4)	0.000
1–3	286 (63.3)	131 (45.8)	155 (54.2)	
4–6	38 (8.4)	28 (73.7)	10 (26.3)	
Haemoglobin test in current pregnant				
No	146 (32.3)	69 (22.5)	54 (37.0)	0.000
Yes	306 (67.7)	92 (63.0)	237 (77.5)	

Table 3 Uptake of prenatal IFAS among the pregnant women in peri-urban Dodoma City (*N* = 452)

	n (%)	Mean(SD)
Routine uptake of IFAS (at least once in previous week) *n* = 452		
Yes	161 (35.6)	
No	291(64.4)	
Gestational age (weeks) when started iron-folic acid supplements s (*n* = 161)		
First trimester	42 (26.1)	16.92(6.16)
Second trimester	107 (66.5)	
Third trimester	12 (7.5)	
Source of prenatal IFAS (*n* = 161)		
Antenatal clinic	139 (86.3)	
Private pharmacy	20 (12.4)	
Others	2 (1.2)	
Intake of prenatal IFAS previous day (*n* = 161)		
Yes	83 (51.6)	
No	78 (48.4)	
Reasons for not taking prenatal IFAS previous day (*n* = 78)		
I didn't have the tablets	58 (74.4)	
Forgotten	11 (14.1)	
Side effects (vomiting, nausea, body weakness, heart palpitation)	6 (7.6)	
Others (sickness, didn't want to)	3 (3.8)	

Table 4 Associates of routine uptake of prenatal iron-folic acid supplementation among pregnant women in peri-urban, Dodoma City

	Exp (B)	95% C.I. for EXP(B)		
		Lower	Upper	*P* – value
Number of ANC visits	1.69	1.35	2.13	0.000
Haemoglobin test during current pregnancy	3.02	1.86	4.89	0.000
Gestational age	1.04	1.00	1.06	0.050
Gravidity	1.28	0.63	2.61	0.493
Parity	0.67	0.32	1.41	0.292
Interval since the last pregnancy	1.0	1.00	1.00	0.60

shows about 22.3% of women who had a live birth and/or stillbirth in the last 2 years prior to the study in Dodoma Region took iron-containing supplements in less than 60 days throughout the gestation period [16]. In contrast with the current finding, the study done in Kiambu County Kenya [2] and another in Puducherry, India [21] demonstrated more than 30% of pregnant women took prenatal IFA supplements in at least 4 out of seven days. This dissimilarity could be attributed to the differences in study settings. Both two previous studies conducted at health facilities where women were attending antenatal clinics. Pregnant women attending regular antenatal clinics are likely to be those women who have good access to health care facility and good adherence to prenatal IFAS. In addition, the study in India was conducted in a health centre where all pregnant attending antenatal clinic had been given dose of one month IFAS prior to the study. Our study was conducted at a community settings involving pregnant women with limited access to the health facilities. Possible explanations for the intermittent and low proportion for routine uptake of prenatal IFAS in this study includes; limited health care facilities in the study area which are the main source of prenatal IFA supplements, unavailability of prenatal IFA supplements at the health care facility, as this study was conducted during COVID-19 era when some medical supplies including prenatal IFA supplements may have been limited. Nonetheless, it may be prudent for stakeholders to consider review of prenatal IFAS to better ensure provision of iron supplementation in community settings with limited access to health-care professionals to reach the most vulnerable populations and thereby ensure a timely and continuous supply of supplements [7].

Prenatal IFAS is a part of the antenatal package and normally dispensed at the healthcare facility during ANC visits [15]. The majority of pregnant women in our study initiated prenatal IFA during second trimester of pregnancy, because they initiated pregnancy related antenatal care during that time period [16]. However, this study also observed that a lack of prenatal IFA supplements was the main reason why most pregnant women did not take the supplementation. According to the Tanzania's national ANC guidelines [15], it is recommended that every pregnant woman take the prenatal IFA supplement daily. These supplements are normally dispensed on a monthly basis during ANC clinics starting from the first visit. A possible explanation for a pregnant woman not having prenatal IFA supplements in this study may be due to missed ANC visits, which is common in Tanzania for a range of complex reasons [16]. In contrast, it may also be that the health facilities did not have prenatal IFA in stock. This study was carried out during the early days of the COVID-19 pandemic which likely contributed to inadequate health seeking behaviours, and limited supply of drugs and medicines, including prenatal IFA supplements across the country. Community-based and national advocacy about early antenatal attendance, monitoring and evaluation of prenatal IFAS and supplies may be recommended strategies to improve the current situation.

This study found that the number of ANC visits was associated with the routine uptake of prenatal IFAS. Importantly, pregnant women receive prenatal IFA supplements at the health care facility during ANC visits [16]. Thus, if the pregnant woman's first ANC visit is delayed or she does not attend ANC as scheduled, she will not receive recommended IFA supplements. This is similar to the results of previous studies which demonstrated that women who attended ANC regularly were more likely to use prenatal IFA supplements [22–25]. The current finding demonstrates the need to continue emphasizing the importance of early and regular ANC attendance to ensure effective utilization of ANC services including prenatal IFAS.

This study found that, pregnant women who had haemoglobin levels tested had triple odds of using prenatal IFA supplements compared to those with unknown haemoglobin levels. A possible explanation for this finding could be that haemoglobin testing may have been a reflection of ANC care quality, including quality education and access to prenatal IFA supplements. At each ANC visit the pregnant woman is supposed to receive a monthly dosage of IFA supplements. If a pregnant woman is able to attend her ANC visits and IFA supplement is available and dispensed by the care provider, she should have regular access to IFA for the duration of pregnancy. Similar findings have been reported in other recent Tanzanian studies [22, 26].

Although not statistically significant in multivariable analysis, the prevalence of prenatal IFAS uptake increased with gestational age and the interval since last pregnancy. Previous national health survey [16] report had demonstrated that many pregnant women initiate pregnancy-related ANC visits during the fourth month of pregnancy. This suggests that majority of pregnant women begin receiving prenatal IFAS starting in the second trimester with access to the supplements during subsequent ANC visits. This finding is similar to another study conducted in Kenya [2]. Regarding the interval since last pregnancy, women with longer intervals were more likely to take prenatal IFA supplements compared with those with shorter pregnancy intervals. It would be interesting to explore the underlying reasons for this relationship. High interval could be associated with maturity, additional lived experience with the physiologic demands of pregnancy and postpartum recovery and perhaps deeper knowledge about prevention of anaemia. Future studies might consider exploration of this finding to better understand prenatal IFAS therapy adherence.

Conclusions and recommendations

Approximately one third of the pregnant women took iron-folic acid supplementation at least once a week. Intake of iron and folic acid supplementation once a week can be best termed as intermittent. The current practice for IFAS is unacceptably low towards the efforts for the prevention of maternal anaemia and associated adverse pregnant outcomes in this community. Strategies to promote early antenatal care attendance and effective education about the importance of IFAS are recommended. Healthcare facilities should strengthen their antenatal care services by ensuring; (1) haemoglobin testing of all pregnant women and effective education about the test results; (2) monitoring the availability of prenatal IFA supplements at the health facility level (3) exploring adherence of prenatal IFAS among clients and implementing novel community based strategies to increase uptake; and (4) strengthening client and community-based counselling about IFAS and its importance during pregnancy to increase adherence. Stakeholders are urged to consider novel systems for provision of prenatal IFAS in community settings with limited access to health-care professionals in order to reach the most vulnerable populations and ensure a timely and continuous supply of supplements.

Strength and limitations of the study

The strengths of this study include that this study provides evidence about routine uptake of prenatal IFAS that was previously limited in our peri-urban setting in central Tanzania. The study was community-based which allows generalizability to populations in similar settings. Information about maternal characteristics was collected from RCH 4 cards to facilitate reliable data collection and minimize bias due to self-reporting. Limitations include, the findings on intake of prenatal IFAS are based on reported data from the respondents which may be subject to either under-reporting or over-reporting. This study was also conducted in 2020, during the early months of the COVID-19 pandemic with related health systems challenges. As such, it is hoped that access to reliable prenatal IFA supplements may have changed and it is possible that ANC visit adherence and health-seeking behaviours have also increased. This study was a cross-sectional study hence we cannot establish effect-causal relationship.

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Author contributions

The authors' responsibilities were as follows-MJM led the design of research proposal, funding acquisition, overall supervision data collection, conducted data analysis and led the manuscript writing. IHM provided technical support during proposal development. MJM, NSG, AFN and IHM contributed from the inception of the research protocol, supervision of data collection and manuscript writing. All authors read and approved the final manuscript.

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Data availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request. Email address: munyogwam@gmail.com.

Declarations

Ethical considerations

This study was approved by the Institution Research Ethics Committee (IRREC) (UDOM/DRP/134/VOL VII/) of the University of Dodoma. The permission to conduct this study was obtained from the office of Dodoma Regional Administrative Secretary, District Medical Officer and the office of respective Ward Executive Officers. Respondents were given detailed information about the aim of the study. Each respondent provided with either verbal or written informed consent before data collection. For minors, aged 15 to 17 years, informed consent was provided by the minor together with either her husband, if married, or legally acceptable adult guardian, including parents if not married. The respondents were ensured of confidentiality and freedom of participation in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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