Anemia during Pregnancy; How much is Known? A Case of Moshi Town in Kilimanjaro Region, Tanzania

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Authors' contributions

This work was carried out in collaboration between all authors. Author RN designed the study, wrote the protocol, collected data and revised the manuscript. Authors JC and EK supervised the study, managed the analyses of the study, wrote the first draft and subsequent versions of the manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: Knowledge and practices of both men and women on factors that contribute to anemia in pregnancy needs to determined if sound and successful measures to prevent pregnancy anemia are to be implemented. This study was designed to understand knowledge, practices and attitudes of pregnant women and men on anemia during pregnancy.
Study Design: This was a cross sectional study.
Place and Duration of Study: The study was conducted in Moshi town, in Kilimanjaro Region, Tanzania between January and May, 2012 in 4 health centers.
Methodology: A total of 64 participants were enrolled, involving 44 pregnant women, 11 in each study centre, 18-45 years old, and 20 married men, 5 in each center attending health care services. A structured, 'close ended question' questionnaire was used for data capturing after it was pre-tested. Participants were asked questions and responses were recorded by the investigator. Data was analyzed using Statistical Package of Social Sciences (SPSS 20.0) in which mainly descriptive statistics was used.
Results: Approximately 82% (n=36) of women were spending ≤ 60 minutes to reach the ANC, majority (68.2%, n=30) incurring less than Tanzanian Shillings (TAS) 1,000 per visit while 13.6% (n=6) were parting with more than TAS 2,000 per visit. Compliance to required 4 antenatal clinics (ANC) visits was high by 93.2% (n=41) with a mean gestation age at first visit at 18th week. Causes of anemia were known by 93.8% (n=42), with 79.7%, 96.2%, 80.8% and 67.4% having good knowledge on malaria as a cause of anemia, foods and medications that prevent anemia and cut-

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off hemoglobin level for anemia, respectively. Knowledge on effects of anemia on birth outcomes was poor with 17 (26.6%) with adequate knowledge.

Conclusion: Although ANC services are very accessible in the study area and pregnant women keep ANC visits, we report presence of inadequate knowledge on anemia in pregnancy, particularly effects on birth outcomes. Strengthened training and increased scope of education on reproductive health in general during ANC clinics should be prioritized.

1. INTRODUCTION

Anemia in pregnancy is still one of the world's leading causes of maternal and fetal morbidity and mortality and thus a serious global public health problem particularly in developing countries. About 95% of anemia cases associated with pregnancy occurs in poor countries and less than 20% developed countries [1]. Prevalence rates of maternal anemia for developing countries range from 35 to 72% for Africa, 37 to 75% for Asia and 37 to 52% for Latin America [2]. Anemia in pregnancy affects both the pregnant mother and the fetus, as it deprives the fetus of sufficient blood which contains all essential nutrients for it to develop, predisposing to preterm delivery, low birth weight, still birth neonatal and maternal deaths [3].

Maternal anemia may result from multiple factors. In Sub-Saharan Africa, where the problem of anemia is more serious, iron deficiency often exacerbated by hookworm infection, other nutritional factors, social economic factors, sickle cell disease and increasingly infection with HIV are also important factors for anemia among pregnant women [4]. Infectious diseases such as malaria have also been identified as major contributors to anemia in underdeveloped world [5]. According to Goonewardene and colleagues, strategies to prevent anemia in pregnancy and its adverse effects include treatment of underlying conditions. Thus, a clear understanding of the underlying causes of anemia is crucial to the management of this syndrome [6-10].

The current study was carried out in an area where little has been studied and documented about how much is known about anemia during pregnancy. Most previous studies have not assessed knowledge of men about anemia. Knowledge and practices of both men and women on factors that contribute to anemia needs to be assessed together. This study was designed to understand how pregnant women and men understand anemia in terms of causes, risk factors, and ways of prevention. Data from this study will have impact in devising appropriate interventional strategies for preventing and managing pregnancy anemia.

2. MATERIALS AND METHODS

2.1 Study Location and Population

This was an analytical cross-sectional study conducted in 2012 in 4 health facilities within Moshi Urban and Moshi Rural districts in Kilimanjaro Region. Kilimanjaro region is located in North Eastern part of Tanzania, made of six administrative districts which are Rombo, Hai, Moshi Rural, Moshi urban, Mwanga and Same. The study centers included 1 referral hospital (Kilimanjaro Christian Medical Center, KCMC), 1 Health Centre (Majengo) and 2 designated hospitals (Kibosho and St Joseph's). The Moshi Urban district borders to the north with the Moshi Rural District, to the east by Mwanga district and to the south and west by the Manyara region and Hai District respectively. This district is the administrative, commercial and tourist centre of Kilimanjaro region and the entire Northeast Tanzania. The main food crops cultivated in these districts include; maize, bananas, potatoes, beans, rice, fruits, ground nuts, sunflower and vegetables. The main cash crops are mostly coffee and sugarcane. The study population was pregnant women, 18-45 years old who were attending ANC at the 4 hospitals and married men, 18-60 years old attending health care services in these hospitals. A total of 60 participants were recruited into the study.

2.2 Sampling and Recruitment Procedures

The four study health facilities were samples conveniently. In each health facility, 15 participants of which 11 were pregnant women and 5 were married men, who were attending ANC and health services during the study, were

interviewed. Participants were recruited on a 'first come first saved' style until when the desired number was reached. None of the approached participants refused to participate in the study. Male participants included were those who were married and who accompanied their wives at the day of interviews. Informed consent from all participants was sought and obtained after the study was explained to them. Participants voluntarily agreed to participate and were free to refuse.

2.3 Data Collection Tools and Procedures

The study was conducted in January and May 2012, by use of a structured questionnaire. The questionnaire was developed in English and translated into Kiswahili versions for data collection because it is the language spoken by almost all participants in health care delivery system in the area. The questionnaire consisted of mainly close ended questions. The instrument was pre-tested on 5 pregnant women at KCMC Antenatal Clinic and 5 men who were not included during actual data collection. These findings were not included in the analysis. Participants were asked questions and responses were filled in the questionnaires by an investigator. Male participants were interviewed in the absence of their wives.

2.4 Data Analysis

Data obtained from this study was entered into MS excel and then, exported to Statistical Package of Social Sciences (SPSS 20.0) software for analysis.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Demographic data

Table 1 shows the socio-demographic and economic characteristics of participants. Sixty four participants from four health facilities took part in the study. Of these, 44 (68.8%) were females. Their age ranged from 19 to 44 with mean (±SD) of 29.1 (±5.4) years. Majority (68.8%) were 30 years or younger. Males were generally older than female participants (mean age for male, 31.4 vs female; p=0.017). All of them were either married at the time of the study or previously married. More than half (54.7%) had up to primary education; three quarters (75.0%) were Christians and approximately half of them (46.9%) were self-employed. Of 40 (62.5%) of participants who indicated their average monthly income, nearly half (47.5%) were earning up to Tanzanian Shillings (TAS) 100,000 per month.

3.1.2 Accessibility and utilization of antenatal clinic (ANC) services

Only female respondents answered questions related to ANC attendance. The proportion of respondents according to time spent to reach the antenatal clinic is shown in Fig. 1. Approximately 82 % of women were spending up to 60 minutes to reach the ANC.
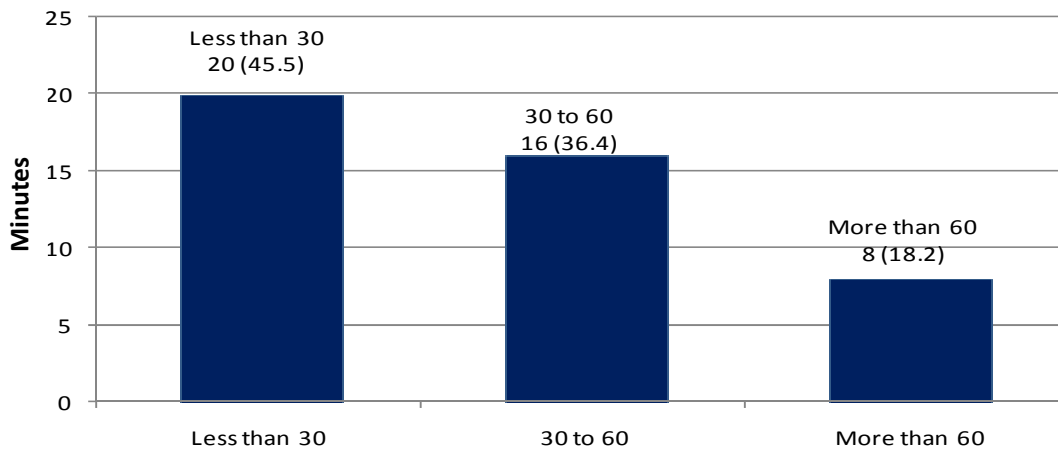

Fig. 1. Time (in minutes) spent by pregnant women to reach an ANC centre

Table 1. Socio-demographic and economic characteristics of participants

Variable	Attribute	No. (%)
Sex:	Male	20 (31.3)
	Female	44 (68.8)
Age (years):	Mean (SD; Range)	29.1 (5.4; 19-44)
	30 or younger	44 (68.8)
	Older than 30	20 (31.3)
Education level:	Up to primary	35 (54.7)
	Secondary	23 (35.9)
	Post-secondary	6 (9.4)
Marital status:	Ever married (married/separated)	64 (100.0)
Occupation:	Unemployed	25 (39.1)
	Employed	9 (14.1)
	Self-employed	30 (46.9)
Religion:	Christian	48 (75.0)
	Moslem	16 (25.0)
Health facility;	KCMC	15 (23.4)
	Majengo clinic	16 (25.0)
	St. Joseph hospital	17 (26.6)
	Kibosho hospital	16 (25.0)
Average monthly income (TAS) (n=40):	Up to 100,000	19 (47.5)
	100,001 - 200,000	9 (22.5)
	200,001 - 500,000	9 (22.5)
	More than 500,000	3 (4.7)

Of 44 women, majority (68.2 %, n=30) were incurring less than TAS 1,000 per visit while 6 (13.6%) were parting with more than TAS 2,000 per visit (Fig. 2).

Female respondents were asked to mention the number of ANC visits they make during pregnancy. Majority of 44 respondents (93.2%) were making more than three ANC visits during pregnancy. Only three respondents (6.8%) were attending only three times during pregnancy.

3.1.3 Obstetric history of pregnant women

Mean gestation age of present pregnancy among 44 women was 32.4±7.4 (range, 13-40) weeks. More than half of women (54.5%) were in the pre-term (< 37 weeks) gestation age. Of 44 women, slightly more than a third of women have had no previous deliveries (para 0) while 19 (43.2%) had one live birth. The distribution of parity is shown in Fig. 3.
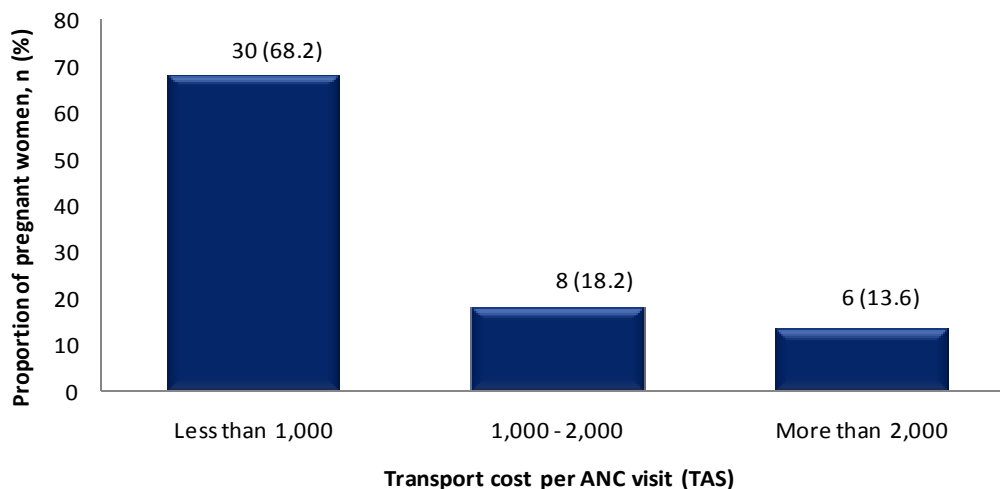

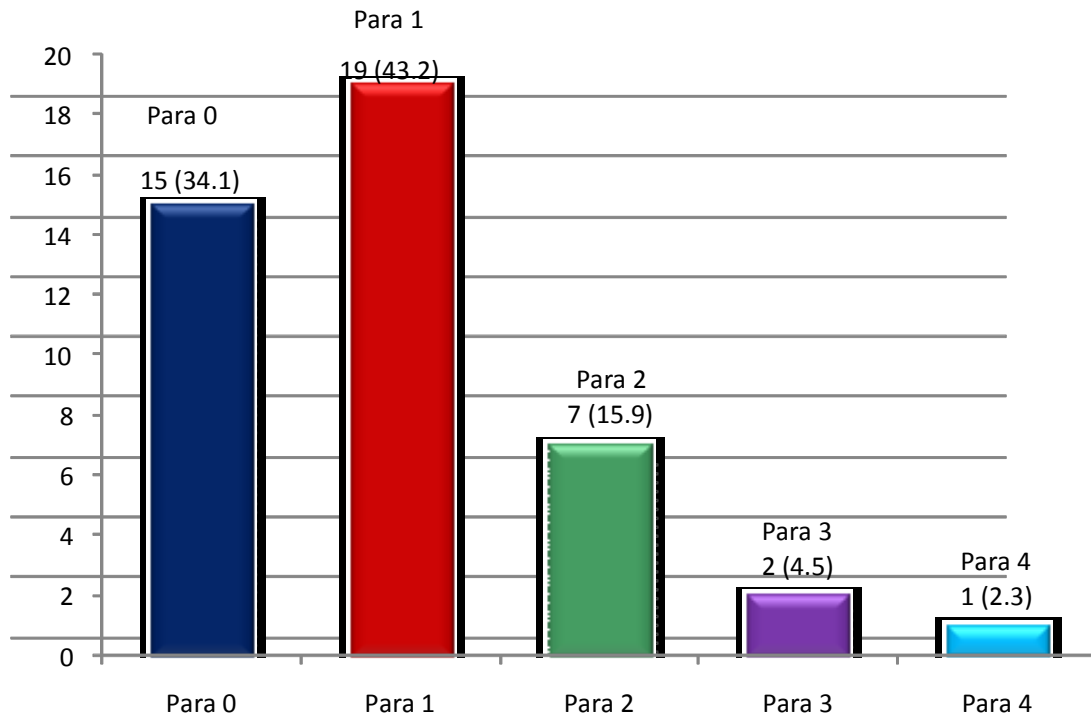**Fig. 2. Transport costs (TAS) spent by women to reach ANC centers**

Fig. 3. Proportion of women who attend ANCs the first or return visit with different parities

Among 44 pregnant women, only 9 (20.5%) were making the first antenatal clinic visit. For the remaining 35 women who were making return visits, a quarter (25.0%) made their first ANC at 20th week of gestation age, about one-fifth (20.5%) at 16th week of gestation. Mean gestation age at first visit was 18th week with standard deviation of 5.4 weeks and range 4-32 weeks. Women making return visits were asked whether they were keeping their appointment dates. All 35 women said they were keeping their appointments.

3.1.4 Health education of anemia during ANC visits

Women respondents were asked whether nurses attending them talked about anemia during pregnancy during their ANC visits. Of 44 women, 26 (59.1%) admitted that they discussed about anemia. Of 26 women who admitted to have heard talks on anemia during pregnancy were further asked on what were the talks about. Fig. 4 shows the distribution of issues covered. Majority of women said talks were on foods for preventing/alleviating anemia (96.2%) and on drugs (80.8%). Less concentration was paid on activities and exercise (50.0%), and drinks (53.8%).

Respondents were asked to mention at what hemoglobin level a pregnant woman is said to have anemia. Among 64 respondents, the response rate to the question was 71.9% (n=46). Of 46 who answered the question, slightly more than two thirds (67.4%) gave the correct response (less than 11g/dL). Causes of anemia known by a large proportion of respondents were poor diet (93.8%) and malaria (75.0%). Results are shown in Fig. 5.

The four causes were scored and total knowledge score on causes categorized into adequate knowledge (score > 2.0) and inadequate (score 2 or less). Mean score on knowledge for causes of anemia during pregnancy was 2.5±1.1 (range, 0-4) points. Half of respondents (50.0%) had adequate knowledge on causes of anemia during pregnancy. Comparison between mean scores of male and female respondents indicated that there was no significant difference in knowledge between male and female at 5% level of significance (2.2 vs. 2.7; *P*=0.077).

Fig. 6 shows the distribution of knowledge on effects of anemia in pregnancy. At least half of the respondents did not know that anemia could result in low birth weight (50.0%), pre-term

babies (57.8%), stillbirths (50.0%) and abortions (51.6%). A relatively high proportion of respondents (42.2%) did not know that anemia in pregnancy could result in neonatal death. However, they had good knowledge that anemia could result in maternal death (92.2%).

Combining 'don't know' and 'no' responses into 'no' and scoring 1 point for 'yes' and 0 points for 'no', the 6 effects of anemia in pregnancy were

scored. Mean score effects of anemia in pregnancy was 2.4±1.9 (range, 0-6) points. At cut-off of at least 4 for 'adequate knowledge', only 17 (26.6%) had adequate knowledge on the effects of anemia in pregnancy. Comparison of mean scores of knowledge on effects of anemia between male and female demonstrated significant difference at 5% level of significance with male having lower mean score compared to female (1.7 vs. 2.8 points respectively; P= 0.022).
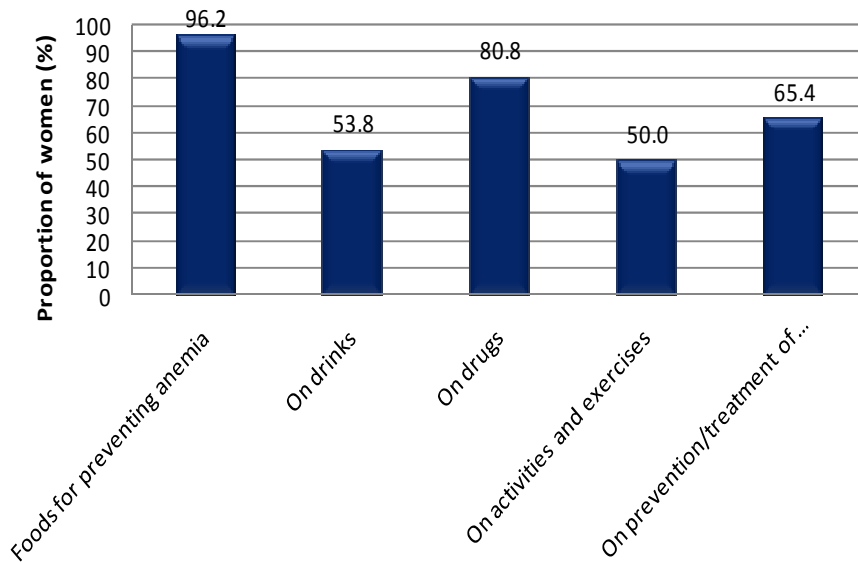

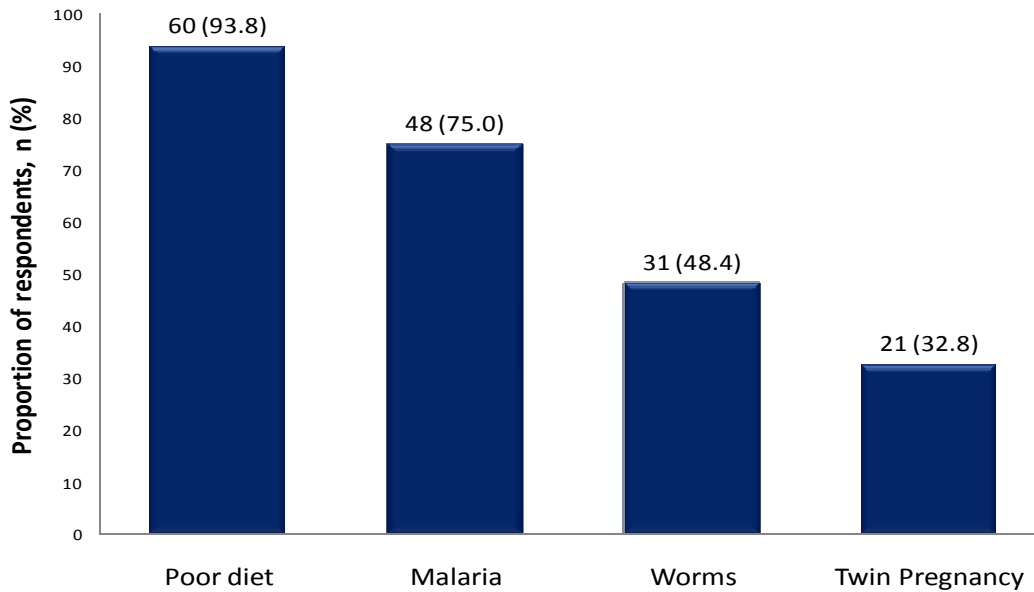**Fig. 4. Issues talked by nurses during ANC visits**

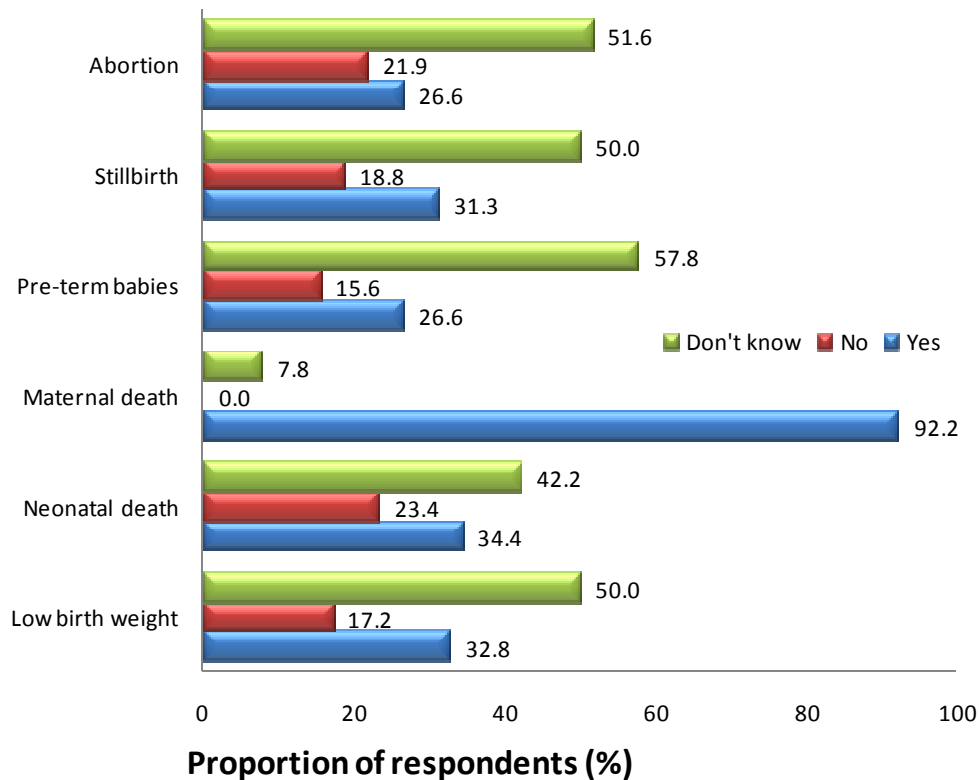**Fig. 5. Cause of anemia during pregnancy**

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Fig. 6. Outcomes of anemia in pregnancy

Respondents were asked if they have ever heard about any measures that could be taken to prevent anemia in pregnancy. About two-thirds of respondents (67.2%) said they have heard. Of these, majority have heard on the radio (65.1%, n=28) followed by 'from clinic nurses' (58.1%, n=25). Other sources were used by less than half of respondents.

Respondents were asked whether prevention of malaria during pregnancy can prevent anemia in pregnant women. More than three quarters of respondents (79.7%) agreed that prevention of malaria can reduce incidence of anemia in pregnancy. Pregnant women were asked whether they are using preventive measures to reduce incidence of malaria and/or anemia that is, Intermittent Preventive Treatment (IPT), use of vouchers to purchase cheaply insecticide treated bed-nets (ITNs), and use of antihelmintics) during pregnancy. Fig. 7 shows the proportion of pregnant women using the preventive measures. More than 70 percent of women in the health facilities studied are applying preventive measures.

Respondents were asked to indicate from a list foods that can alleviate or prevent anemia in pregnancy. At least half of respondents had good knowledge that green vegetables (81.3%) can alleviate/prevent anemia, 35.9% Sardines 'Dagaa', 51.6% liver and 50.0% eggs. Pregnant women were asked whether they had ever had anemia during their pregnancy. Self-reported anemia among pregnant women was 22.7%.

3.1.5 Health-seeking behavior for anemia

All ten women who reported to have had anemia during pregnancy reported to have gone to hospital, one (used herbal medicine and 3 (30.0%) bought drugs from a drug store/pharmacy. Eight out of ten women (80.0%) reported to have been cured after getting treatment.

3.1.6 Risk behavior for anemia in pregnancy

Women were asked whether they eat soil during pregnancy. More than one-third of women (36.4%) admitted to eat soil during pregnancy. These were further asked whether they think soil eating habit can increase the risk for them to get anemia during pregnancy. Of 16 women, 5 (31.3%) agreed that soil eating would increase the risk for anemia, 4 (25.0%) said 'no' and 7

(43.8%) did not know. Women were also asked whether they prefer eating of raw starch during pregnancy. Only 7 of 44 women (15.9%) said they prefer to eat raw starch during pregnancy.

3.1.7 Preventive measures for anemia regarding food eating habits

Women were asked if they had any food taboos during pregnancy. Ten (22.7%) said they had food taboos. When asked to mention the types of taboo foods, mostly eggs were mentioned, and one each mentioned honey, porridge prepared from finger millet and porridge from green bananas ('mtori'). Pregnant women indicated variation in eating eggs. Nearly half of women (47.7%) were not eating eggs during pregnancy and 10 (22.7%) were eating two or more than two eggs per week respectively.

3.2 Discussion

We sought to understand how much pregnant women and male parents understand about anemia during pregnancy. We also aimed at assessing the practices and attitudes of pregnant women on anemia. Several aspects from accessibility of ANCs, causes of anemia, effects and preventive measures were studied. Our study indicates that most ANC facilities were adequately accessible in Moshi Municipality in terms of both distance, cost and time spent to reach an ANC. This is a better than the average national accessibility of ANCs

On practices, we found most women keep their ANC visit appointments. Almost all pregnant mothers reported to make more than three ANC visits during pregnancy. From this study, we report ANC coverage to be a success story in

Moshi Township compared to previously reported results [11-13]. According to the World Health Organization (WHO), to achieve the full life-saving potential that ANC promises for women and their newborns, four visits that provide essential evidence based interventions, a package called 'focused antenatal care' is required. According to the WHO clinical Guidelines model, the four ANC visit schedule is supposed to commence on week 8-12 [14]. We report a mean gestation age at first visit to be 18th week with standard deviation of 5.4 weeks and range 4-32 weeks in the current study. This is a six-week delay compared to the WHO Clinical Guideline model.

Although ANC services are accessible, affordable and pregnant mothers keep ANC visit appointments in the study area, we report a clear gap between the good accessibility and the delayed gestation age at first ANC visit. Several barriers such as lack of money distance to the health facility, lack of privacy to attending ANC and postnatal clinics (PNCs) and ignorance have previously been reported by other studies [15-21]. For many of the essential interventions in ANC, it is critical to have early identification of underlying conditions e.g. prevention of congenital syphilis, control of anemia, and prevention of malaria complications. It therefore of paramount importance that the first ANC visit is as early as possible in pregnancy, preferably in the first trimester.

On issues of health education, about two-thirds of pregnant women admitted to have received education of anemia during ANC visits mainly on foods and drugs that prevent and cure anemia respectively but very little or nothing was
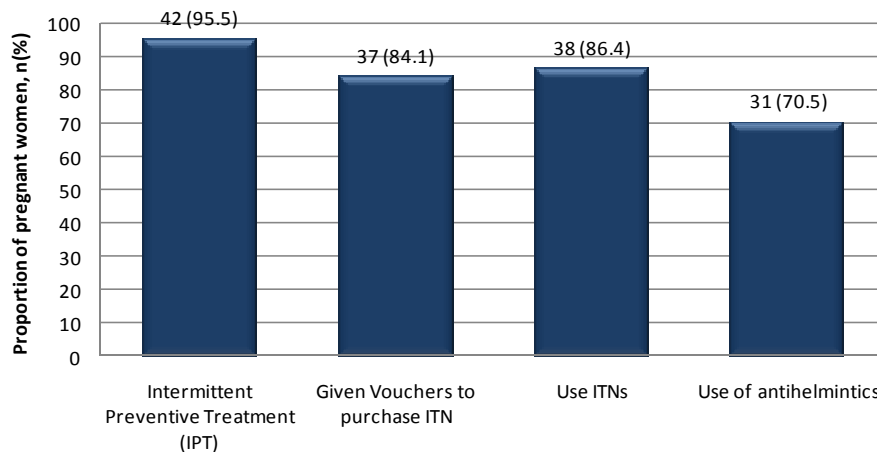

Fig. 7. Malaria / anemia preventive measures in pregnancy

discussed about other issues. They also had adequate knowledge on the definition of anemia in terms of hemoglobin concentration. Although majority of respondents had good knowledge that maternal death is one of the adverse consequences of anemia during pregnancy, only about half of the respondents had knowledge that anemia could result to several other adverse pregnancy outcomes such as low birth weight, pre-term babies, stillbirths and abortions. On this aspect, males had very lower knowledge on anemia outcomes than females.

Anemia affects nearly half of all pregnant women in the world and is a risk factor for both maternal and fetal morbidity and mortality. This calls for an urgent need to strengthen education of anemia during focused ANC visits particularly to para 0 pregnant women who may lack exposure to practical reproductive problems. Lower knowledge score on anemia effects among males has many implications, the traditional poor attendance to ANCs by males being among the reasons. Good care during pregnancy is important for the health of the mother and the development of the unborn baby. It is of paramount importance for increased education on ANC services among married couples and the importance of male partners to attend ANCs. As the main bread earners in most rural and impoverished communities, male partners hold a critical position in prevention of anemia during pregnancy through obtaining the right foods for the pregnant spouse.

Four fifth of respondents had good knowledge that malaria is a cause of anemia in pregnancy and thus majority used preventive measures to reduce incidence of malaria and had good knowledge regarding food that prevent anemia during pregnancy, most important being green vegetables. Malaria in pregnancy has been previously reported as an important cause of anemia. For about a decade now, the Tanzania National Voucher Scheme (TNVS) has significantly scaled up availability and accessibility of ITNs to particularly pregnant mothers and children, and endeavor accomplished by subsidizing costs of bed-nets in Tanzania mainland [22]. Similar programs such as Under-five Catch-up Campaign (U5CC) and Universal Coverage Campaign (UCC) have been put in place to control malaria and have continued to provide an effective integrated malaria control environment through increased ITN use, subsidized tests, artemisinin-based medicines, Intermittent Preventive and Treatment

during pregnancy (IPTp) and massive community sensitization. The net result of these strategies is reduction in pregnancy associated incidence and mortality rates in Tanzania. These strategies need to be sustained if the health of the pregnant mother and the newborn are to be safe guarded. Our study showed that, food taboos during pregnancy was reported as a common practice among half of pregnant women, eating eggs being the leading taboo. Women also reported honey, finger millet as forbidden foods during pregnancy. This practice has been previously reported in other parts of Africa [7,9,10].

4. CONCLUSION

ANC services are very accessible in the study area and pregnant women keep ANC visits; however, the first ANC visit is made late. We report presence of fair knowledge on anemia during pregnant, which did not differ among men and women. Food taboos during pregnancy are prevalent in the study community; this is likely to contribute to the prevalence of anemia during pregnancy. We propose strengthened efforts in terms of training and increased scope of education on reproductive health in general during ANC clinics particularly on focus areas such as anemia that pose a direct risk to the pregnant mother and the expected new born.

CONSENT

All authors declare that 'written informed consent' was obtained from the participants for publication of this study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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