

# Assessment of the Quality of Antenatal Care Services and the Associated Risk Factors in Tanzania

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Abstract

**Background:** This study gives the finding of the assessment made on the quality of antenatal care (ANC) services received by women in Tanzania during pregnancy and the associated risk factors.

**Methods:** We used the data from the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS). The sample included 6,924 women who gave birth in the five years before the survey and having at least one ANC visit in the most current pregnancy. The quality of ANC services provided was assessed using six questions on receipt of recommended components of ANC services. The responses of the individual components were summed up to generate the ANC service provision score. In so doing, the women who received all six components were considered to receive good quality ANC services. A weighted logistic regression model was employed in the examination of the factors associated with the quality of ANC services.

**Results:** The average service provision score was 4.4 out of a total of 6. Approximately, 31% of the women received good quality ANC services. The most provided ANC components were blood sample measurement (87%) and iron tablets/syrup (82.1%). The urine sample (60%) was the least offered ANC service. The results of the adjusted logistic regression model revealed that age, place of residence, education level, the time of the first ANC visit, number of ANC visits, and family wealth index were significant factors associated with the quality of ANC services.

**Conclusions:** In terms of service provision, the quality of ANC service in Tanzania is suboptimal. With differences by observed risk factors, there must be more efforts to strengthen the quality of ANC services and to remove the differences.

**Keywords:** Antenatal care, Quality of care, service provision, Tanzania.

## **Plain English Summary**

This article gives the findings of the assessment made on the quality of ANC services received by women in Tanzania during pregnancy and the associated risk factors. Secondary analysis of 2015-16 TDHS-MIS data was done using SAS version 9.4. The study population is 6,924 women who gave birth in the five years before the survey and had at least one ANC visit in their most recent pregnancy.

The findings showed that, though a majority of the women in Tanzania go for ANC, at least, once during pregnancy, a majority of them do not receive good quality ANC services. The risk factors related to the quality of ANC services are the education level, wealth status, areas of living, the time of starting ANC in the first trimester; and the number of ANC visits.

## **Background**

Maternal and child health is a global priority. Its priority roots from the increased harmful effects on socio-economic development due to a high number of maternal deaths from pregnancy complications stemming from poor health care. According to the World Health Organization(WHO)[1], around 830 women across the globe die every day due to pregnancy complications; with the majority of the deaths taking place in low- and middle-income countries (LMICs)[1].

Antenatal care (ANC) is important for pregnant women in that it reduces or eliminates the risk of complications during and after pregnancy[2, 3].WHO elaborates on the importance of ANC with the argument that it is a platform for several health functions that include health promotion and sickness screening, prevention, and diagnosis in the goal to achieve suitable evidence-based practices[4, 5]. Pertinent to this advantage of ANC, WHO recommends ANC as a minimum

schedule of care. In 2002, WHO recommends for at least four ANC visits[6], which was to be increased to a minimum of eight visits based on the suggestion update from 2016[5].

Consequently, more women are receiving ANC. Globally, 83% of the women had at least one ANC visit during the period of 2007-14 and, 64% received a minimum of four visits[7]. According to 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) report, 98% of pregnant women received ANC service from qualified health service providers. However, the quality of ANC services that majority of pregnant women in Tanzania receive leaves a lot to be desired [8].

Though there are new models of ANC introduced by WHO that have been adopted in developing countries, improvement in these countries is still in progress. Its weakness is still seen in the underutilization and poor quality of services provided. For the ANC programme to be effective, important components or components of ANC services must be provided [9-13]. Currently, studies have shown that in low and middle-income countries, Tanzania included, ANC interventions are affected by late initiation of first ANC visit, low content, and poor quality of care[14, 15]. Inadequate ANC, in terms of coverage and quality, has been related to adverse pregnancy outcomes[16]. While the maternal mortality ratio (MMR) is influenced by many causes, including social, cultural, and economic factors, sufficient use of ANC decreases MMR[11, 17].

Besides the high coverage of ANC services in Tanzania, a lot needs to be desired for the delivery of quality ANC services to influence women to access these services. It is important for pregnant mothers to visit ANC facility that meets at least, minimum requirements and be provided with recommended components of ANC services.

Several studies [10-12, 18-20] in Africa have restricted focus on the factors associated with ANC use but with a narrow focus [21-23] on the quality of services provided at various antenatal clinics in Africa. These are a few in Tanzania [24-26] but their scope is geographically restricted. These studies on quality of ANC [24] includes one carried out in Kilombero District, other in Rufiji Rural District [25], and in rural southern Tanzania [26]. There was, thus a need for a study to assess the quality of ANC services in Tanzania. This study is a response to the need of assessing the quality of ANC services in the entire country using national representative data (2015-16 TDHS-MIS data). The study also made a determination of the factors associated with receipt of good quality of ANC services to identify the sources of differences in the quality of health care.

## **Methods**

### **Data Source**

In this study, 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) data were used. The TDHS-MIS survey collected information on demographic, socioeconomic, antenatal care services, fertility levels, marriage, sexual activity, fertility preferences, family planning methods, breast feeding practices, and nutrition.

### **Sample Size and Sampling Procedures**

A nationally representative sample of 13,378 households was selected for the 2015-2016 TDHS –MIS survey. This sample was reached through a stratified two stages sampling technique. To achieve the stratification, each region was divided into urban and rural areas and, thus, 59 sampling strata were created. The first stage involved selecting sample points (clusters), consisting of enumeration areas (EAs) delineated for the 2012 Tanzania Housing and Population Census. In this stage, 608 EAs were systematically selected with probability proportional to the

number of households residing in the EA and with independent selection in every sampling stratum. Among the 608 EAs, 180 EAs were from urban areas and 428EAs from rural areas. A household listing operation was carried out in each of the 608 selected EAs before the main survey. In the second stage, a systematic selection of households was carried out. From the list household, a fixed number of 22 households were systematically selected from each cluster, yielding a representative probability sample of 13,376 households. Out of the total selected households, 3,960 and 9,416 were from urban and rural areas respectively. All women aged 15 to 49 years, being either usual residents of the selected households or visitors present in the household the night before the survey, were eligible in this study. A total of 7,050 women who gave birth in the five years before the survey were involved in the survey. However, the current study includes 6,924(98.2%) of the surveyed women who attended at least one ANC.

### **Outcome Variable**

The current study assessed the 6 recommended components or elements of ANC services in Tanzania. The components included the receiving of iron-folic supplements, Tetanus Toxoid Injections, Malaria intermittent preventive treatment, blood pressure measurement, urine sample taken, and blood sample taken. These elements of measurements are recommended in the previous literature [9, 27, 28]. In this study, the outcome variable was the quality of ANC services. We define the quality of ANC as a receipt of the recommended ANC services during pregnancy[29]. To generate the ANC service provision score, the responses of the individual components were summed up. Mothers who received all the 6 components were considered to receive good quality ANC services as used in previous studies [16].

### **Independent Variables**

The selected exposure variables were mother's age, place of residence, current marital status, education level, time of the first ANC visit, Number of ANC visits, and family wealth index.

### **Data Analysis**

Data analysis was performed using the SAS version 9.4 software. The first analysis included the descriptive statistics presented by means for continuous variables, frequency, and percentages for categorical variables. Bivariate association between the outcome variable and the independent variables was then examined using weighted unadjusted logistic regression model. Moreover, a weighted multivariable logistic regression model was used to assess the condition influence of all selected independent variables on the overall quality of ANC services; this was used to control for confounding. To account for the sampling design of the TDHS-MIS survey, the descriptive statistics, and the analysis of logistic regression models were all weighted using the sample weights provided within the data. A significant level of 5% was used in assessing the association between the quality of ANC services and the selected risk factors.

### **Results**

#### **Background Characteristics**

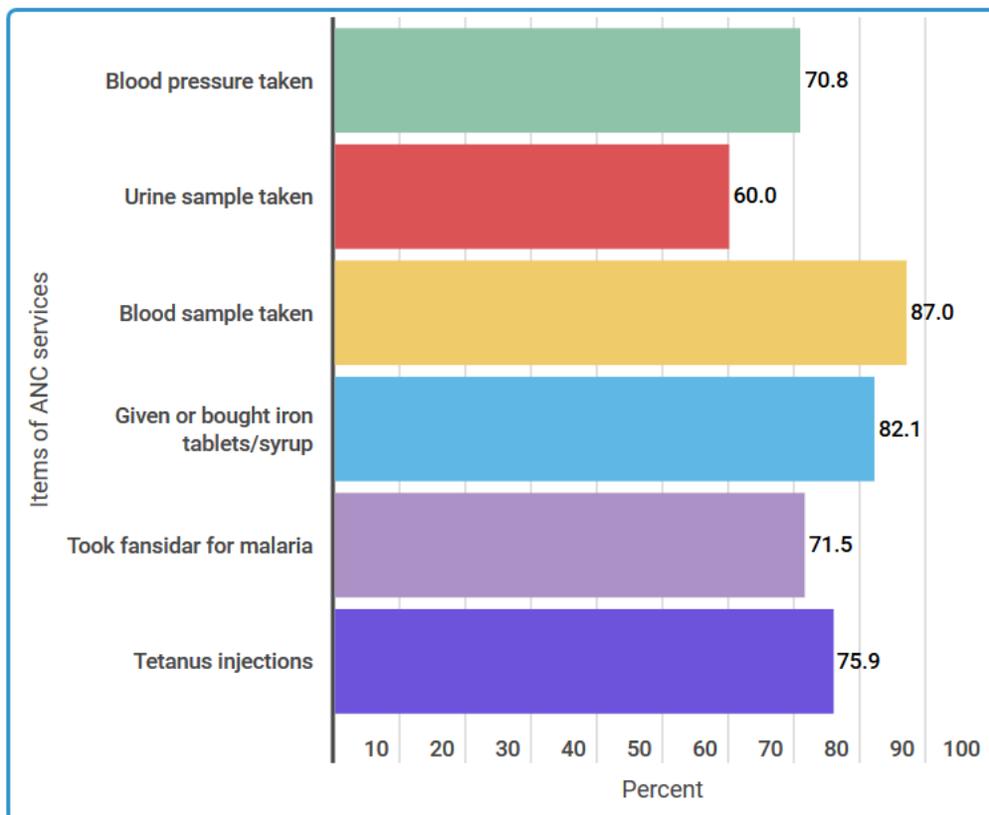
Table 1 displays the weighted and unweighted percentage distributions of the study variables. Unless stated, only the weighted percent is used for the description of the findings. The mean age of the women involved in the study was 29 years, with 48% of the women being aged between 20 and 29 years. Almost 70% of the study population was from rural areas, and 58% of the study population was married. The majority, 65% had only primary education and 19% had no formal education. 66% of the women started the first ANC consultation in the second trimester of their pregnancy. A small majority, 52.2% of them had at least four ANC consultations during the last pregnancy.

**Table 1:** Characteristics of women with at least one antenatal care visit, N = 6,924

Variable	Unweighted		Weighted	
	N	%	%	95% CI
<b>Age(Years)</b>				
<20	541	7.8	8.6	[7.8, 9.4]
20-29	3248	46.9	47.7	[46.3, 49.1]
30-39	2343	33.8	33.2	[31.9, 34.5]
40-49	792	11.4	10.5	[9.6,11.4]
<b>Residence</b>				
Urban	1811	26.2	30.1	[28.8, 31.5]
Rural	5113	73.8	69.9	[68.5,71.2]
<b>Marital status</b>				
Never in Union	441	6.4	7.2	[6.5, 8.0]
Married	4215	60.9	57.7	[56.3,59.1]
Living with a partner	1435	20.7	22.6	[21.4,23.8]
Widowed	119	1.7	2.0	[1.6,2.4]
Divorced	363	5.2	4.7	[4.1, 5.3]
Separated	351	5.1	5.8	[5.1,6.4]
<b>Education Level</b>				
No education	1329	19.2	18.8	[17.7, 19.9]
Primary	4209	60.8	64.9	[63.6, 66.3]
Secondary/higher	1386	20.0	16.3	[15.2,17.3]
<b>Time of ANCfirst visit</b>				
First trimester	1586	22.9	24.9	[23.7,26.2]
Second trimester	4675	67.5	65.8	[64.5,67.2]
Third trimester	663	9.6	9.3	[8.5,10.1]
<b>Number of ANC visits</b>				
1-3	3407	49.2	47.8	[46.4,49.2]
4+	3517	50.8	52.2	[50.8,53.7]
<b>Family wealth index</b>				
Poorest	1399	20.2	21.3	[20.2,22.4]
Poorer	1335	19.3	20.2	[19.0,21.3]
Middle	1363	19.7	19.1	[18.0,20.2]
Richer	1537	22.2	20.2	[19.0,21.3]
Richest	1290	18.6	19.3	[18.1,20.4]

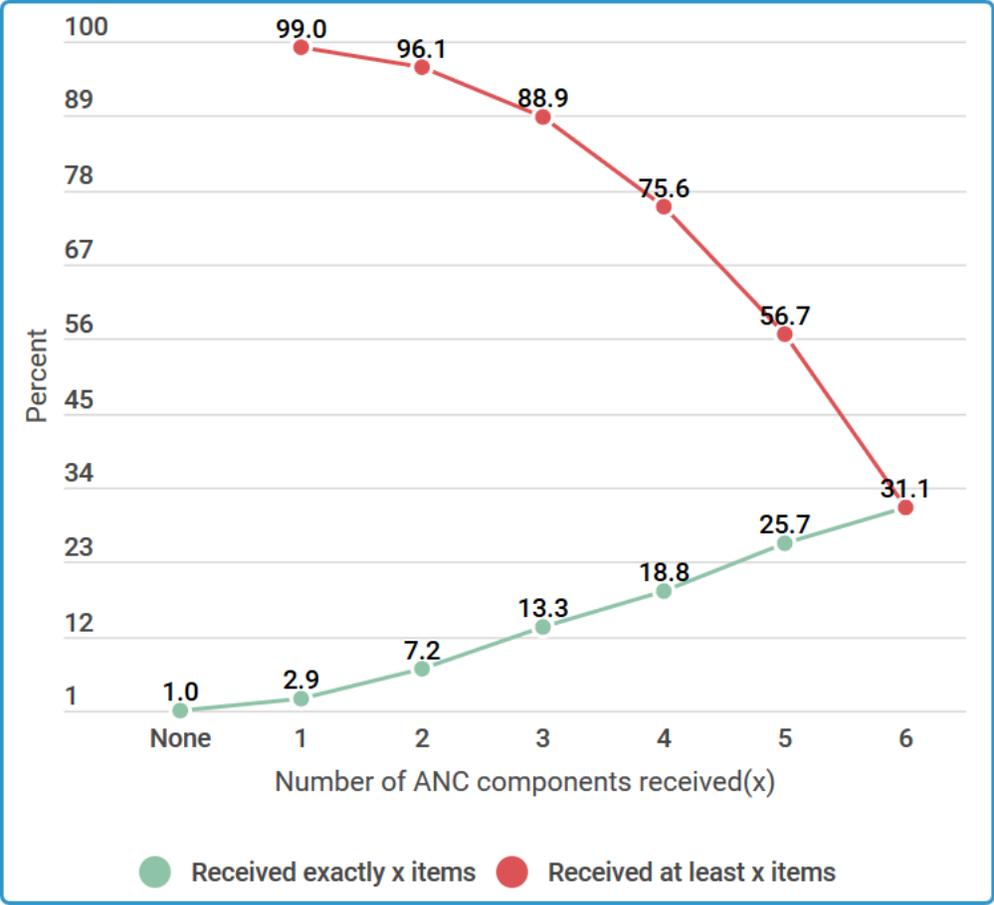
## The Components of ANC Services

As presented in the methodology section, the 2015-16 TDHS-MIS gathered data on the six important components that were used for quality determination of ANC services in Tanzania. The proportion of women who received the recommended components is displayed in Figure 1. Among the six components of the ANC services, a blood sample (87%) was received by most of the women followed by given or bought iron tablets/syrup (82.1%). More than three-quarters (76%) of the mothers received tetanus injections during pregnancy, 72% took SP/fansidar for Malaria, and 71% of the mothers reported to have received blood pressure measurement. The least ANC component received by mothers was urine sample test (60%).



**Figure 1:** The proportion of women received the recommended components of ANC services

Figure 2 shows the number of components of the ANC services received by women in the most recent pregnancy. The components ranged from 0 to 6, and the mean of the total components was 4.4. The analysis showed that only 31.1% of the women in Tanzania received all six recommended components of ANC services. This means about 31% of women received good quality ANC services. It was noted that 99% of the mothers received at least one of the recommended components and only 1% received none of the six recommended components. 13% of the mother received 3 out of the six recommended components, while 19% of them received 4 out of the six components, and 26% received five out of the six components.



**Figure 2:** Percentage distribution of the number of ANC components received by women during their last pregnancy

## **Bivariate Analysis**

Table 2 shows the percentage of women who received good quality ANC services by background characteristics. The table also shows the unadjusted odds ratio (OR) of the fitted weighted bivariate logistic regression model for the quality of ANC services. A higher proportion of mothers aged 20-29 years (35.5%) were observed to receive good quality than women of other age groups. Women in urban areas (51.2%) had more access to receive good quality ANC services than those in rural areas (22.4%). Concerning marital status, the highest proportion of mothers received good quality ANC services was noted among subjects who were never in union (43.4%), followed by separated (35.2%), divorced (34.4%) and married mothers (30.4%). Mothers with secondary/higher education had the highest chance of receiving ANC services of good quality (48.5%) compared to mothers having primary (30.9%) and those with no formal education (16.6%). Women who started ANC consultation from the first trimester (42.6%) had higher prevalence of receiving ANC services of a good quality compared to mothers who started the first ANC consultation in the second (29%) and third trimester (15.1%). 21% of the mothers attended less than 4 ANC visits and 40% of those having four or more visits were observed to receive ANC services of good quality. The proportion of women received ANC services of good quality were gradually increased with the family wealth index from 17% among women in the poorest quintile to 56.3% in the richest quintile. The results of the unadjusted logistic regression analysis showed that all selected exposure variables were significantly associated with the quality of ANC services (Table 2).

**Table 2:** Distribution of women received good quality ANC services, and unadjusted odds ratio(OR) with 95% confidence interval (95% CI) of good quality according to background characteristics

<b>Variable</b>	<b>Number of women (%)</b>	<b>OR (95% CI)</b>	<b>P-Value</b>
<b>Age(Years)</b>		0.98[0.97, 0.99]	<b>&lt;0.0001</b>
<20	149(28.5)		
20-29	1040(35.5)		
30-39	610(28.1)		
40-49	156(22.5)		
<b>Residence</b>			
Urban	834(51.2)	3.63[3.17,4.15]	<0.0001
Rural	1121(22.4)	Reference	
<b>Marital status</b>			<b>&lt;0.0001</b>
Never in Union	171(43.4)	Reference	
Married	1152(30.4)	0.57[0.45,0.72]	<0.0001
Living with partner	371(27.7)	0.50[0.39,0.65]	<0.0001
Widowed	29(23.8)	0.41[0.24,0.68]	0.0007
Divorced	120(34.4)	0.69[0.49,0.97]	0.0319
Separated	112(35.2)	0.71[0.61,0.99]	0.0434
<b>Education Level</b>			<b>&lt;0.0001</b>
No education	215(16.6)	Reference	
Primary	1189(30.9)	2.25[1.86,2.73]	<0.0001
Secondary/higher	551(48.5)	4.74[3.79,5.94]	<0.0001
<b>Time of ANC first visit</b>			<b>&lt;0.0001</b>
First trimester	612(42.6)	Reference	
Second trimester	1252(29.0)	0.54[0.47,0.63]	<0.0001
Third trimester	91(15.1)	0.19[0.13,0.27]	<0.0001
<b>Number of ANC visits</b>			
1-3	707(21.3)	Reference	
4+	1248(40.0)	2.47[2.17,2.81]	<b>&lt;0.0001</b>
<b>Family wealth index</b>			<b>&lt;0.0001</b>
Poorest	240(17.0)	Reference	
Poorer	256(20.0)	1.22[0.98,1.53]	0.0820
Middle	327(25.3)	1.66[1.34,2.05]	<0.0001
Richer	512(38.5)	3.06[5.12,7.72]	<0.0001
Richest	620(56.3)	6.29[5.12,7.72]	<0.0001

### **Factors Associated with the Quality of Antenatal Care services in Tanzania, 2015-16 TDHS-MIS**

In the unadjusted analysis, the quality of ANC services was related to all selected socio-economic and demographic factors. However, to evaluate the condition influence of these factors on the overall quality of ANC services, a weighted multivariable logistic regression model was

fitted to control for confounding. The results of the model presented in Table 3 revealed that, after controlling for the effect of other factors, all the factors considered in the analysis, except the marital status ( $p=0.2434$ ), had a significant association with the quality of the ANC services. Mothers from urban areas had almost 2 times greater adjusted odds of having ANC services of good quality than mothers from rural areas ( $aOR=1.87, p<0.0001$ ). The receipt of ANC services with good quality was significantly negatively related to age ( $aOR= 0.98, p=0.0002$ ). This means that elders were less likely to receive good quality ANC services in comparison to their younger counterparts. Women with primary education ( $aOR=1.56, p<0.0001$ ) and secondary education ( $aOR=1.76, p<0.0001$ ) were significantly more likely to receive ANC services with good quality than those who never attended school. Besides, the adjusted odds of receiving ANC services of good quality was observed to be significantly lower for women started the first ANC consultation in the second trimester ( $aOR= 0.76, p=0.0016$ ), and third trimester ( $aOR=0.40, p<0.0001$ ) as compared to those who started visits from the first trimester. It was also revealed that women who attended four or more ANC visits had greater odds to receive ANC services of good quality than those with less than four visits ( $aOR=1.66, p<0.0001$ ). In the same pattern, the receipt of ANC services with good quality was significantly positively associated with the family wealth index ( $p<0.0001$ ). For example, women belonging to households in the richest quintile had almost 3 times higher odds of receiving ANC services of good quality than those in the poorest quintile ( $aOR= = 2.62, p<0.0001$ ).

**Table 3: Results of the Weighted Multivariable Logistic Regression Analysis for Risk Factor Associated with the Quality of ANC Services**

Variable	Parameter estimate ( $\beta$ )	Adjusted odds ratios ,aOR(95% CI)	P-Value
Age(Years)	-0.02	0.98[0.97,0.99]	<b>0.0002</b>
<b>Residence</b>			
Urban	0.62	1.87[1.54,2.26]	<b>&lt;0.0001</b>
Rural	Reference		

<b>Marital status</b>			0.2434
Never in Union	Reference		
Married	-0.13	0.88[0.68,1.15]	0.3460
Living with partner	-0.25	0.78[0.59,1.03]	0.0801
Widowed	-0.48	0.62[0.36,1.09]	0.0949
Divorced	-0.01	0.99[0.68,1.44]	0.9395
Separated	-0.04	0.96[0.67,1.38]	0.8391
<b>Education Level</b>			<b>&lt;0.0001</b>
No education	Reference		
Primary	0.44	1.56[1.27,1.90]	<0.0001
Secondary/higher	0.57	1.76[1.36,2.29]	<0.0001
<b>Time of ANC first visit</b>			<b>&lt;0.0001</b>
First trimester	Reference		
Second trimester	-0.27	0.76[0.64,0.90]	0.0016
Third trimester	-0.93	0.40[0.27,0.58]	<0.0001
<b>Number of ANC visits</b>			
1-3	Reference		
4+	0.51	1.66[1.43,1.92]	<b>&lt;0.0001</b>
<b>Family wealth index</b>			<b>&lt;0.0001</b>
Poorest	Reference		
Poorer	0.16	1.17[0.93,1.48]	0.1761
Middle	0.36	1.44[1.15,1.80]	0.0014
Richer	0.63	1.89[1.51,2.36]	<0.0001
Richest	0.96	2.62[1.99,3.46]	<0.0001

## Discussion

In this article are the findings of the assessment of the quality of care of ANC services in Tanzania along with the risk factors associated with quality ANC services received by mothers during pregnancy. The analysis showed that majorities (98%) of the women in Tanzania go for ANC at least once during pregnancy but a minority of them (31%) get complete ANC services as recommended. The most common ANC services offered in Tanzania are blood sample tests and distribution of Iron supplements which were offered to more than 80% of ANC users. A high

proportion of mothers received the basic ANC services that included urine test and measurement of blood pressure which were done, at least, once during pregnancy, 1% of the mothers did not receive any of the six components at every ANC visits as recommended by Tanzania National guideline.

The study revealed that woman's age, place residence; woman's education level, the time of ANC first visit, the frequency of ANC visits, and a family wealth index were significant predictors associated with quality of ANC services. As expected, it was observed that women in urban areas were more likely to receive good quality ANC services as compared to women from rural areas. This underlines the fact that women in rural areas have difficulty in getting transported to health care providers compared to their urban counterparts[27]. In addition to the transport problems, shortage of health facilities and well-skilled health providers in rural areas might have contributed to poor quality of ANC services in rural Tanzania. Our finding is consistent with that of the studies conducted in Ghana, Zambia, and Nepal [18, 27, 29]. Another study in Nigeria revealed that mothers in urban areas had higher odds of receiving good quality ANC services in comparison to those in rural areas[30]. The WHO recommended at least four ANC visits during pregnancy[28] for women to receive optimal care. The sufficiency number of ANC visits impacted the chance of receiving good quality ANC service. It was observed that mothers with four ANC visits had a higher chance of receiving good services than those with less than four visits. The same observation was made in the previous studies conducted in Nigeria[30, 31].The mothers who went for the first ANC visit in the first trimester had higher odds of receiving good quality ANC services than those who started to attend the ANC visit in the second and third trimester. This may be because, even though the ANC quality measure uses the basic services that can be provided during the pregnancy, the services are not reliably provided

such that those who start their visits earlier and had frequent visits had a high chance of receiving quality services. This observation is as well supported in the reports of Nigeria, and Ghana [29, 30].

The analysis indicated a positive association between the level of education and the likelihood of receiving quality ANC services. This could be due to the reason that those who are educated are more informed and have a high understand the importance of antenatal care might be the underlying cause for seeking good quality ANC services[32]. This finding that women with higher education level had more chances to receive good quality adds the observation made in Nigeria, Uganda and Nepal [27, 30, 31]. There was a negative association between age and the chance of receiving good quality ANC services.

It was also noted that in Tanzania women from households with higher wealth status had more chances of receiving good quality ANC services. However, the financial status would not provide a logical account of this difference since ANC services in Tanzania, are free. The possible explanations for this would be that, majority of women with higher wealth status live in areas where the quality of care is higher; use health facilities that have good and high quality services; have the capacity to afford and access high-quality care; and are more likely have a relationship with healthy people, which helps them obtain high-quality services [33-38]. The positive association between wealth status and quality of ANC services are consistent with outcomes from other studies on the quality of ANC services[27, 29, 30].

### **Limitations and Strengths**

The current study has several limitations. First, the measures of ANC quality are based on self-report; hence recall bias is a potential limitation as women may not correctly recall whether or not they received service. The period of recall, which can be up to five years for some women, could affect the precision of reporting the services received. However, other studies suggested that women have relatively good recall of maternal events in this period [39, 40]. The second limitation of the study is that it is based on cross-sectional data, which limits causal inference. Social desirability bias is another limitation; mothers may report they received the services because they know they are anticipated to have received the services, which may contribute to the over estimation of the quality of care.

Despite the noted limitations, this study makes valuable contributions to the existing maternal health literature, which is the shortage of studies on the risk factors of quality of ANC services in Tanzania and another low resource setting. Second, the sample size was relatively large, the study used a national representative sample of women who had a live birth in the five years before the survey, therefore, it has high generalizability.

## **Conclusion**

The majority of women in Tanzania go for ANC, at least once during pregnancy but the ANC services received by a majority of them leave a lot to be desired. The factors related to the quality ANC services were education level, higher family wealth index, areas of living, and the time of starting ANC in the first trimester. Differences in the quality of ANC services based on observed associated risk factors is a necessary requirement to ensure that all women have an equal chance of receiving ANC service of high quality.

## **Abbreviations**

**ANC:** Antenatal care, **TDHS-MIS:** Tanzania Demographic and Health Survey and Malaria Indicator Survey, **WHO:** World Health Organization, **MMR:** maternal mortality ratio, **OR:** unadjusted odds ratio, **aOR:** adjusted odds ratio.

### **Ethics Approval and Consent to Participate**

Tanzania's National Institute for Medical Research (NIMR), Zanzibar Medical Ethics and Research Committee (ZAMREC), the Institutional Review Board of ICF International, and the Centers for Disease Control and Prevention in Atlanta provided ethical clearance of 2015-16 TDHS-MIS. A written informed consent of participation was obtained from the respondents aged 18 and above at the beginning of each interview. For those respondents who were less than 18 years old, a written consent of participation was obtained from them and their parents/guardians.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

The used dataset is available from the authors where needed

### **Competing interests**

The authors assert that there are no competing interests.

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## Authors' Contributions

AH substantially contributed to the idea of the work. AH and JM were involved in analysis and interpretation of the data. Both authors drafted the initial manuscript. They revised the manuscript for important logical content. The final draft was written by JM. The final version of the manuscript for publication was approved by both AH and JM.

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## Figure legends

**Figure 1:** The proportion of women aged 15-49 who received the recommended components of ANC services during their last pregnancy, in five years before 2015-16TDHS

**Figure 2:** Percentage distribution of the number of ANC components received by women aged 15-49 during their last pregnancy, in five years before 2015-16TDHS