

Factors Associated with Blood Pressure Checkup During Pregnancy Among Women of Reproductive Age in Tanzania; An Analysis of Data from the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicators Survey

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Abstract

Background: Hypertensive Disorder of Pregnancy (HDP) is one of the leading causes of maternal mortality and morbidity amongst pregnant women in the world. Blood pressure checkups during pregnancy are one of strategies to identify hypertensive disorders and hence timely management. Little is known on factors associated with blood pressure checkups in Tanzania.

Method: The study used data from the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicators Survey (2015-16 TDHS-MIS). A total of 6924 women of active reproductive age from 15 to 49 were included in the analysis. Both univariate and multiple regression analyses were used to determine the association between early antenatal booking and maternal services utilization.

Results: A total of 4997 (72.17%) of interviewed women were checked for blood pressure at least once. After adjusted for the confounders, factors which influenced uptake of blood pressure checkups during pregnancy were timing for antenatal booking within first 12 weeks, AOR=1.496 at 95% CI= 1.297-1.726, p<0.001, age group [more than 34 years, (AOR=1.518 at 95% CI=1.149-2.006, p=0.003)], wealth index [middle income, (AOR=1.215 at 95% CI=1.053-1.468, p=0.008) and rich, (AOR=2.270 at 95% CI=1.907-2.702, p<0.001)] reference population being poor; education level [primary education, (AOR=1.275 at 95% CI=1.107-1.468, p=0.001); secondary, (AOR=2.163 at 95% CI=1.688-2.774, p<0.001) and higher, (AOR= 9.929 at 95% CI=1.355-72.76, p=0.024)] reference population being no formal education; parity [para 2-4, (AOR=1.190 at 95% CI=1.003-1.412, p=0.046) and zones [Unguja Island, (AOR=3.934 at 95% CI=1.568-9.871, p=0.004) and Pemba Island, (AOR=5.308 at 95% CI=1.808-15.58, p=0.002)] Mainland urban being the reference population

Conclusion: Blood pressure checkups during pregnancy offer the opportunity for early detection timely management of HDP. The study revealed that rural dwelling pregnant women had higher chance not to get their BP checked. It was also revealed that maternal age, education level, place of residence, wealth index and timing of ANC services significantly associated with blood pressure check-ups. The study identifies the need to explore significant factors associated with utilization of the available free reproductive health services across all public health facilities and to address prioritized intensive awareness programs and behavioral change interventions on the significance of BP checkups among pregnant women of reproductive age.

Background

Maternal mortality is inadmissibly high worldwide. In 2017, about 295 000 women died during pregnancy and childbirth. About 94% of these deaths occurred in low-resource settings, and most could have been prevented [1]. Sub-Saharan countries are reported to have 533 maternal deaths per 100,000 live births, which is equal to 200,000 maternal deaths yearly. The SSA alone accounts for the two thirds of all global maternal deaths per year [2]. In Tanzania, about 556 maternal deaths per 100,000 live births occurred [3]. Maternal deaths occur due to both direct and indirect causes. Direct causes of maternal deaths include

postpartum haemorrhage, hypertensive disorders, puerperal sepsis, unsafe abortion and obstructed labour [4].

Globally, hypertensive disorder of pregnancy (HDP) is one of the leading direct causes of maternal mortality and morbidity amongst pregnant women [5, 6]; accounting for nearly 12% of the global maternal deaths [5]. Hypertension in pregnancy is a condition in which systolic blood pressure (SBP) measures ≥ 140 mmHg and/or diastolic blood pressure (DBP) of ≥ 90 mmHg confirmed when blood pressure is measured within four hours apart. HDP encompasses a variety of disorders which include pre-existing hypertension, gestational hypertension, preeclampsia/eclampsia, and superimposed hypertension [6]. Pre-eclampsia and eclampsia cause the most serious consequences to the mother and the baby [7]. These conditions are associated with vasospasm, pathologic vascular lesions in multiple organ systems, increased platelet activation and resulting in derangement of coagulation system in the small blood vasculature [7]. A study done in Turkey found that hypertensive disorders was the third most frequent cause among all causes and the second among direct causes of maternal deaths [8].

Tanzania ranked the 4th highest number of maternal deaths in Sub-Saharan Africa and the 6th highest in the world [9]. Hypertensive disorders, especially eclampsia contributed about 19% of maternal deaths, and it was reported the 2nd after postpartum hemorrhage, in Tanzania [10] (Ministry of Health, Community Development, Gender, Elderly and Children, 2018). The incidence of preeclampsia was estimated to be seven times higher in developing countries than developed countries ranging from 1.8–16.7% [7].

Blood pressure (BP) checkups during pregnancy are one of strategies to identify hypertensive disorders and hence timely management [11]. However, the check-ups depend on adequate and timely antenatal care (ANC) services utilization. ANC attendance offers the mother with opportunity to undergo blood pressure check-ups [12, 13]. Studies have shown that majority of women in sub-Saharan Africa book ANC services late [12–14]. Recent WHO guideline recommends the pregnant woman to undergo blood pressure checkups for not less than eight times, where the first takes place in the first trimester, 2 checkups in the second trimester, and 5 checkups in the third trimester [15]. Late ANC initiations deny pregnant women from meeting this goal; hence becoming difficult detecting and managing HDP timely [16]. According to TDHS 2015/16, about 49% of pregnant women did not complete the recommended ANC contacts, hence likely to miss the opportunity to check their blood pressure [17].

Potential associated factors were extracted from the literature which included maternal age, place of residence, education level, socioeconomic status, parity and timing of ANC services. Maternal age have been reported in some studies [18, 19]. Moreover, two studies done in Ethiopia found that place of residence and education level of the woman contributed to status of ANC attendance for BP checkups [20, 21]. Educated woman have a greater awareness of the existence of ANC services and the benefits of using such services [22]. Furthermore, socioeconomic status of the woman was also a challenge. Studies showed that good economic status of the woman enables her complete the required number of required BP check-ups [19, 22, 23]. Moreover, a systematic review study that included 74 studies found that low

parity was associated with adequate ANC service utilization [23]. Women with high parity tend to under-utilize ANC services, hence, missing the opportunity to have their blood pressure adequately checked [24, 25].

However, little is known on factors associated with blood pressure checkups in Tanzania. The study thus set out to analyze factors associated with blood pressure checkups during pregnancy among women of reproductive age in Tanzania, using data from the 2015-16 Tanzania HIV and Malaria Indicators Survey.

Methods

Study Area and period

The study was conducted in the United Republic of Tanzania from August 22, 2015, through February 14, 2016. Tanzania among the countries found in East Africa. It is the largest country that covers 940,000 square kilometers and 60,000 square kilometers is inland water. The country lies south of the equator and shares borders with eight countries: Kenya and Uganda to the North; Rwanda, Burundi, the Democratic Republic of Congo, and Zambia to the West; and Malawi and Mozambique to the South.

Study Design

It was a national-based cross-sectional study utilizing the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) dataset.

Study Population

All women of reproductive age (aged 15–49 years) were the study population. The study used Individual file recode (TZIR7BFL) with a total of 13266 women who responded to the survey (97% response rate). The study included only women who remembered the timing for antenatal booking of their youngest child. Those who were not able to recall the timing and those who did not respond to the question were removed from the analysis. A total of 6924 women who had birth within five years preceding the survey were included in the study.

Sampling Technique

Two stages of sampling were used to obtain a sample for urban and rural areas in Tanzania Mainland and Zanzibar. In the first stage, a total of 608 clusters were selected and in the second stage, a systematic selection of households was involved. A total of 22 households were then systematically selected from each cluster, yielding a representative probability sample of 13,376 households for the 2015-16 TDHS-MIS. To enhance representativeness Tanzania was divided into nine geographic zones. Grouping the regions into zones was done to reduce sampling error by increasing the number of people in

the denominator. The zone was western (Tabora and Kigoma regions), Northern zone (Kilimanjaro, Tanga, and Arusha), Central zone (Dodoma, Singida and Manyara), Southern Highland zone (Iringa, Njombe, and Iringa), Southern zone (Lindi and Mtwara), South West Highland zone (Mbeya Rukwa and Katavi), Lake zone (Kagera, Mwanza, Geita, Mara, Simiyu, and Shinyanga), Eastern zone (Dar es Salaam, Pwani, and Morogoro) and Zanzibar (Kaskazini Unguja, Kusini Unguja, Mjini Magharibi, Kaskazini Pemba and Kusini Pemba).

Data Collection Tool

The 2015-16 TDHS-MIS used household questionnaires and individual questionnaires. These questionnaires based on the Measure DHS standard AIDS Indicator Survey and Malaria Indicator Survey questionnaires standards. They were adapted and modified to reflect the Tanzanian population. They were translated into Kiswahili, Tanzania's national language. The data presented in this study are from the individual questionnaire.

Study variables

1. **Dependent Variable:** Blood pressure check-up
2. **Independent Variables:** Maternal Age, Place of Residence, Marital Status, Socioeconomic status (Wealth Index) and parity of the mother.

Data analysis

Data were analyzed using Statistical Package for Social Sciences (IBM SPSS version 20). Data analysis started by describing all study variables using frequencies and percentages, we then assessed the association between a dependent variable and independent variables using the chi-squared test, and finally, we performed binary logistic regression analysis (univariate and multivariable) to determine significant predictors for uptake of blood pressure checkup during pregnancy.

Results

Majority of study respondents 5113(73.8%) resided in the rural setting of Tanzania, aged 20 to 34 years 4557(65.8%), had primary education 4209(60.8) and were married 5650(86.1%) Table 1

Table 1
Socio-demographic Characteristics

Variables	Frequency	Percent (%)
Place of residence		
Urban	1811	26.2
Rural	5113	73.8
Age group		
Less than 20 years	541	7.8
20 to 34 years	4557	65.8
More than 34 years	1826	26.4
Educational level		
No education	1329	19.2
Primary education	4209	60.8
Secondary	1326	19.2
Higher	60	0.9
Parity		
Para one	1595	23
Para 2-4	3154	45.6
Para 5+	2175	31.4
Wealth index		
Poor	2734	39.5
Middle	1363	19.7
Rich	2827	40.8
Marital Status		
Never in union	441	6.4
Married	5650	86.1
Widow	119	1.7
Separated	714	10.3
Respondent currently working		
Not working	1498	21.6

Variables	Frequency	Percent (%)
Working	5426	78.4
Mainland/Zanzibar		
Mainland urban	1618	23.4
Mainland rural	4357	62.9
Unguja (Zanzibar Island)	594	8.6
Pemba (Pemba Island)	355	5.1

INSERT Table 1 HERE

Ever Checked Blood Pressure During Pregnancy

Majority of interviewed women, 4997 (72.2%) were checked for their blood pressure at least once while a total of 1927(27.8) were never checked for their blood pressure during pregnancy (Fig. 1)

INSERT FIGURE 1 HERE

The relationship between women’s characteristics and ever checked blood pressure during pregnancy

Women’s characteristics which showed significant relationship with ever checked for blood pressure were place of residence ($p < 0.001$), age group ($p < 0.001$), education level ($p < 0.001$), parity ($p < 0.001$), wealth index ($p < 0.001$) and zones ($p < 0.001$) Table 2.

Table 2
The Relationship between women's characteristics and ever checked blood pressure during pregnancy

Variables	Ever Checked	Never Checked	X2	p-value
	n (%)	n (%)		
Place of residence				
Urban	1593(88)	218(12)		
Rural	3404(66.6)	1709(33.4)	304.553	< 0.001
Age group				
15–19	340(62.8)	201(37.2)		
20–34	3319(72.8)	1238(27.20)		
35–49	1338(73.3)	488(26.7)	25.521	< 0.001
Educational level				
No education	823(61.9)	506(38.1)		
Primary education	2922(69.4)	1287(30.6)		
Secondary	1193(90.0)	133(10)		
Higher	59(98.3)	1(1.7)	314.868	< 0.001
Parity				
Para one	1165(73)	430(27)		
Para 2–4	2362(74.9)	792(25.1)		
Para 5+	1470(67.6)	705(32.4)	34.964	< 0.001
ANC Booking				
Late booking	3746(70.2)	1592(29.8)		
Early booking	1251(78.9)	335(21.1)	46.094	< 0.001
Wealth index				
Poor	1586(58)	1148(42)		
Middle	923(67.7)	440(32.3)		
Rich	2488(88)	339(12)	639.450	< 0.001
Marital Status				
Never in union	325(73.7)	116(26.3)		

Variables	Ever Checked	Never Checked	X2	p-value
Married	4075(72.1)	1575(27.9)		
Widow	88(73.9)	31(26.1)		
Separated	509(71.3)	205(28.7)	0.981	0.806
Mainland/Zanzibar				
Mainland urban	1405(86.8)	213(13.2)		
Mainland rural	2676(61.4)	1681(38.6)		
Unguja (Zanzibar Island)	575(96.8)	19(3.2)		
Pemba (Pemba Island)	341(96.1)	14(3.9)	704.290	< 0.001

INSERT Table 2 HERE

After adjusted for the confounders, factors which influenced uptake of blood pressure checkups during pregnancy were timing for antenatal booking within first 12 weeks, AOR = 1.496 at 95% CI = 1.297–1.726, $p < 0.001$, age group [more than 34 years, (AOR = 1.518 at 95% CI = 1.149–2.006, $p = 0.003$)], wealth index [middle income, (AOR = 1.215 at 95% CI = 1.053–1.468, $p = 0.008$) and rich, (AOR = 2.270 at 95% CI = 1.907–2.702, $p < 0.001$)] reference population being poor; education level [primary education, (AOR = 1.275 at 95% CI = 1.107–1.468, $p = 0.001$); secondary, (AOR = 2.163 at 95% CI = 1.688–2.774, $p < 0.001$) and higher, (AOR = 9.929 at 95% CI = 1.355–72.76, $p = 0.024$)] reference population being no formal education; parity [para 2–4, (AOR = 1.190 at 95% CI = 1.003–1.412, $p = 0.046$) and zones [Unguja Island, (AOR = 3.934 at 95% CI = 1.568–9.871, $p = 0.004$) and Pemba Island, (AOR = 5.308 at 95% CI = 1.808–15.58, $p = 0.002$)] Mainland urban being the reference population (Table 3).

Table 3
Factors associated with ever checked blood pressure during pregnancy

Variable	OR	95%CI		p-value	AOR	95%CI		p-value
		Lower	Upper			Lower	Upper	
ANC Booking								
Late booking	1				1			
Early booking	1.587	1.388	1.815	< 0.001	1.496	1.297	1.726	< 0.001
Age groups								
Less than 20 years	1							
20 to 34 years	1.585	1.316	1.909	< 0.001	1.193	0.951	1.498	0.127
More than 34 years	1.621	1.323	1.985	< 0.001	1.518	1.149	2.006	0.003
Place of residence								
Urban	1							
Rural	0.273	0.234	0.318	< 0.001	1.044	0.388	2.81	0.932
Wealth index								
Poor	1				1			
Middle	1.518	1.325	1.741	< 0.001	1.215	1.053	1.402	0.008
Rich	5.312	4.634	6.09	< 0.001	2.27	1.907	2.702	< 0.001
Educational level								
No education	1				1			
Primary education	1.396	1.227	1.588	< 0.001	1.275	1.107	1.468	0.001
Secondary	5.515	4.468	6.808	< 0.001	2.163	1.688	2.774	< 0.001
Higher	36.275	5.01	262.6	< 0.001	9.929	1.355	72.76	0.024
Parity								
List of figures								

Variable	OR	95%CI		p-value	AOR	95%CI		p-value
		Lower	Upper			Lower	Upper	
Para one	1							
Para 2–4	1.101	0.96	1.262	< 0.001	1.19	1.003	1.412	0.046
Para 5+	0.77	0.667	0.887	< 0.001	0.958	0.775	1.185	0.694
Mainland/Zanzibar								
Mainland urban	1				1			
Mainland rural	0.241	0.206	0.282	< 0.001	0.459	0.168	1.25	0.128
Unguja (Zanzibar Island)	4.588	2.841	7.409	< 0.001	3.934	1.568	9.871	0.004
Pemba (Pemba Island)	3.693	2.123	6.423	< 0.001	5.308	1.808	15.58	0.002
List of figures								

INSERT Table 3 HERE

Discussion

This study used data from the 2015-16 Tanzania HIV and Malaria Indicators Survey to define factors associated with blood pressure check-ups among pregnant women reproductive age.

The study found that ANC booking increased the likelihood of blood pressure checkups among pregnant women. This agrees with findings reported by other studies conducted elsewhere in SSA countries [12–14]. Blood pressure checkup is important for timely detection and management of hypertensive disorders of pregnancy [5, 6].

This study also found that age of women determined the blood pressure checkups during pregnancy. For example, in this study, women aged 34 + years were more likely to have adequate BP checkups than their colleagues. One study conducted in Rwanda supports this [19]. However, Ali et al., [2018] in their literature review study, found mixed findings arguing that the younger woman, had higher likelihood to utilize ANC services hence, increased the chance of blood pressure checkups. Besides, the same study showed that many studies supported older women i.e. aged between 25 to 30yrs or above had higher chance to check their blood pressure more frequently regarding to their frequent ANC service utilization. Sociocultural, ethnicity and geographical differences could be the cause for observed the differences.

Other significant findings were place of residence, education level and wealth index of the woman. Two studies conducted in Ethiopia supports this argument [20, 21]. Rural women lack exposure to health information concerning the importance of ANC service utilization. Also, rural women are less likely to be empowered than do urban women. Another significant finding in this study was that, pregnant women residing in Tanzania Mainland had a small chance get their BP checked during pregnancy compared to those dwelling in the Tanzania Zanzibar. However, the WCBA from Pemba were more likely to use ANC services for BP checkups than those from Unguja. Geographical differences and quality of health care services provided could be the reason.

According to this study, women with higher education were nine or more times likely to check their blood pressure during pregnancy. This was supported by a literature review study conducted elsewhere in African countries [21]. Educated women tend to have a greater awareness of the existence of ANC services and the benefits of using such services [22]. However, in contrast, Rurangirwa et al., [19] in their study found no any statistical significance.

The analysis also revealed that richer women were 2.3 times likely to get their blood pressure checked during pregnancy compared to their counterparts. This finding is supported by one study conducted in Indonesia. The researcher argued that richer women were four times more likely to be checked their BP during pregnancy compared to the poorer women [22]. Furthermore, although Okedo-Alex et al., [23] supported it, Rurangirwa et al., [19] argued against it. According to Rurangirwa et al, [19] having household assets (which were proxy to socioeconomic status) contributed nothing to the woman's reinforcement to utilizing ANC clinics for BP check-ups and other related services. This could be due to women empowerment differences, irrespective of the family wealth.

According to this study, the higher the parity, the reduced is the chance of the woman to get her blood pressure checked during pregnancy. This is attributed by the facts that high parity women tend to rely on their experiences from previous pregnancies and thus not feeling the need for ANC services [23]. The finding is further supported by two studies conducted elsewhere in China and Tanzania [24, 25].

Conclusion

Blood pressure checkups during pregnancy offer the opportunity for early detection timely management of HDP. The study revealed that rural dwelling pregnant women had a higher chance not to get their BP checked during pregnancy. It was also revealed that maternal age, education level, place of residence, wealth index and timing of ANC services significantly associated with blood pressure check-ups. The study identifies the need to explore significant factors associated with utilization of the available free reproductive health services across all public health facilities and to address prioritized intensive awareness programs and behavioral change interventions on the significance of BP checkups among pregnant women of reproductive age.

Abbreviations

ANC	Antenatal Clinic
BP	Blood Pressure
DHS	Demographic Health Survey
DBP	Diastolic Blood Pressure
HDP	Hypertensive Disorder of Pregnancy
SBP	Systolic Blood Pressure
TDHS-MIS	Tanzania HIV Demographic and Health Survey and Malaria Indicators Survey
WHO	World Health Organization

Declarations

Ethics approval and consent to participate

Data collection and the survey content and protocol were approved by Tanzania's National Institute for Medical Research (NIMR), the Zanzibar Medical Ethics and Research Committee (ZAMREC), the Institutional Review Board of ICF International, and the Centers for Disease Control and Prevention in Atlanta, USA. Participants provided verbal consents and the household interviews took place privately. For participants under the age of 18, written consent was requested from their parent or guardian.

Consent for publication

Not applicable

Availability of data and material

The data that support this analysis are available from the 2015-16 Tanzania HIV and Malaria Indicators Survey (THMIS). This survey was conducted by the National Bureau of Statistics (NBS) in collaboration with the Tanzania Commission for AIDS (TACAIDS) and the Zanzibar AIDS Commission (ZAC), the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDEC) (Tanzania) and the USAID-Funded Measure DHS project. Data is available from the authors upon reasonable request and with permission from MEASURE DHS

Competing interests

Authors declare there is no competing interest

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Authors' contributions

FVM did the conceptualization, data analysis and drafted the manuscript and led the process of critical revision of the manuscript. MT wrote the introduction and discussion section and critical review of the manuscript. All authors read and consent for the manuscript to be submitted for peer review.

Availability of data and materials

Data set is available and can be shared on request

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Figures

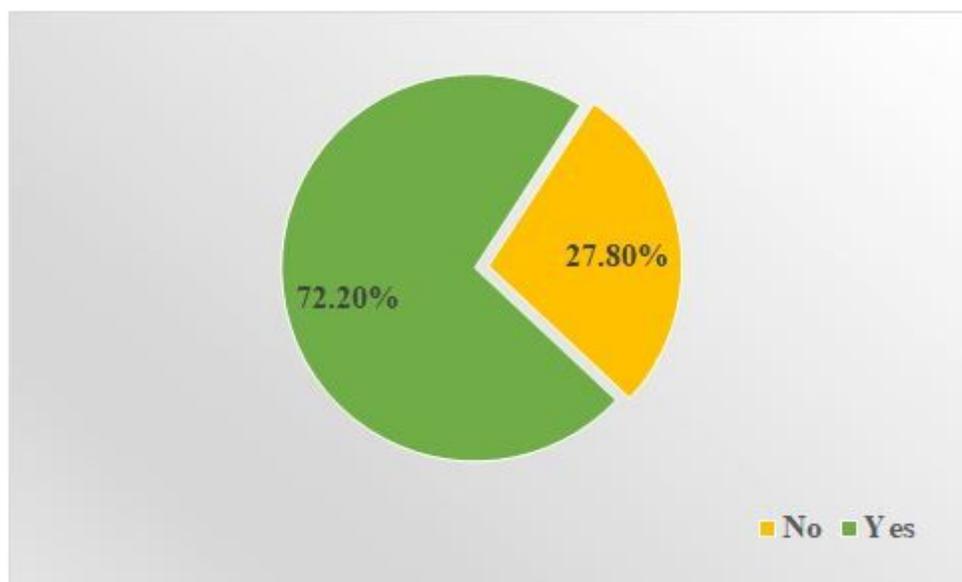


Figure 1

During pregnancy, blood pressure ever taken

Supplementary Files

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