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Understanding Impeding Contexts to Implementation of the Abuja Declaration: Factors Associated with None Use of Treated Bed Nets among Pregnant Women in Tanzania

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Abstract

Background

Malaria remains a significant public health problem despite ongoing efforts that began with Abuja Declaration on Roll Back Malaria (RBM) then Global Technical Strategy for Malaria 2016-2030 including RBM Partnership Strategic Plan 2018–2020. The Abuja Declaration's goal was to ensure that by 2005, 60% of pregnant women and children slept under a treated bed net (ITN), consequently reducing the burden of malaria by half. Ten years after Abuja Declaration Analysis of the Tanzania Demographic Health Survey and Malaria Indicator Survey (TDHMIS) 2015-2016 data that succeeded the Abuja Declaration target was done to shed light on factors to be addressed to bridge the gap to the target thus informing ongoing Malaria control strategies.

Methodology

It included extraction, cleaning and analysis of data for 1137 pregnant women that included bivariate analysis of the association of ITN and independent variables using STATA 12. Variables with p-value <0.02 were include in multivariate log-binomial regression model to determine independent variables, the significance level was p-value = 0.05.

Results

The study included 1137 pregnant women of whom 55.7% slept under an ITN the previous night. Those with high likelihood of sleeping under an ITN were women from the richest wealth quintile compared with poorest; AOR=2.243 95% CI (1.523-3.305); also having three or more under-five children AOR=2.909 5%CI (1.511-5.57) and coming from house hold having a radio AOR=1.42 95%CI (1.05-1.91). Low likelihood was observed among those without health insurance AOR 0.44, 95CI (0.24-0.78) and coming from household without electricity AOR=0.36, 95%CI (0.14-0.94), these were significantly associated with pregnant women sleeping under a treated bed net last night.

Conclusion and recommendations

Abuja declaration gap to target was significant despite the ongoing efforts, since only 55.5% pregnant women utilized ITNs compared to 2005 Abuja 60% target and hence it has been off-track for the ten years. Factors associated were wealth, fewer children in a household, electrified households, radios possession and health insurance enrolment. Thus, it is recommended to merge strategies on access to media, knowledge empowerment and poverty alleviations along with sustained access to treated bed nets to be on track with the rollback malaria strategies.

Keywords: Treated bed nets, Malaria in Pregnancy, Abuja declaration.

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Introduction

Malaria remains a significant public health problem despite the decline from 236 million cases in 2000 to 225 million in 2019 (1) . Despite the decline there was a gross malaria inequality with WHO Africa carrying disproportionately bigger portion of the global malaria burden. That notwithstanding, Africa Union response to the inequality included the adoption and ratification of the Abuja Declaration to guide national responses to the high risk of Malaria in Africa through the MDG strategies to guide planning and investments in the control of malaria in Africa (2). In addition, the decline was attributed to global efforts which included adoption of the Millennium Development Goal (MDG) strategies of which target number 6. Goal was to have halted and begun to reverse the incidence of malaria and other major diseases by 2015 (3). Translating MDGs the Abuja declaration target was to reduce by half, mortality attributed to malaria in Africa among others, declaring that by 2005 at least 60% of pregnant women at risk of malaria would have accessed and used a suitable combination of personal and community protective measures which among others included sleeping under treated bed net (ITN) and intermittent treatment of malaria. Thus, it is now time to demonstrate to what extent the Abuja declaration target of 60% for pregnant women sleeping under ITN achieved, the target gap including which factors contributed towards observed target gap ten years later and lessons learnt.

The impact of Malaria in pregnancy is multifaceted, on one side it is associated with an increased risk of maternal mortality and maternal anaemia (4). On the other hand is associated with adverse pregnancy outcomes that include maternal morbidity, spontaneous abortions, preterm delivery, intrauterine growth retardation and low birth weight (5) It can also result in to stillbirth, vertical malaria infection, neonatal morbidity and mortality especially in high-risk countries like sub-Saharan Africa including Tanzania. Thus, MDGs promoted availability and accessibility to the malaria intervention aiming to benefit all including pregnant women fortifying the Abuja Declaration. The MDG benefits included a reduction in maternal morbidity and mortality due to malaria, improved birth outcomes as well as a decline in infant mortality. While the MDGs blend with Abuja declaration achievements averted to some extent the high maternal and child morbidity and mortality which is un-proportionally high in Sub Saharan Africa, the Sustainable Development Goals (SDG) ought to take on board and sustain the gains from MDGs and it also have to address the deficiencies by adopting innovative strategies based on real data on the ground(6). SDG should also be informed on the implementation facts which include that malaria incidences declined from 80 per 1000 in 2000 to 57 per 1000 in 2019 the decline was steep (27%) between 2000 and 2015, but the rate of decline reverted to 2% from 2016 onwards. In addition, globally in 2019 mortality due to

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malaria was high, estimated at 409,000, which was disproportionally higher in Africa as it was also home for about 94% of the malaria deaths (1). Also, recent reports confirm that the global malaria reduction trend was not on track, and estimated that the malaria burden has recently increased by 23% by 2020 (7).

This assertion is further supported by a study done elsewhere which reported that between 2010 and 2016 there was a significant decline in bed net use among pregnant women (8). The downward trend of bed net use among pregnant women was also paralleled with the significant upsurge of malaria morbidity in 2015 (9). Thus, the levelling and subsequent rise in malaria transmission impacted highly vulnerable populations' especially pregnant women. Consequently, it is agreeable that the goal to end malaria by 2030 in high-risk areas is now off track and the sustainable development goals should now adopt innovative approaches to bring it back on track (10). Thus, there is an indisputable need to put malaria control back on track following prior frameworks like the Abuja declaration to ensure that pregnant women are protected. This study aims to assess the extent to which pregnant women slept under a treated bed net and the determinants using Tanzania Demographic Health and Malaria Survey data. Thus, it will contribute information on the level of use of treated bed nets among pregnant women and associated factors which also contributes towards efforts focused at reverting back to the Abuja declaration track towards 2030 targets.

Methodology

The study used the sixth Tanzania Demographic, Health and Malaria Indicator Survey (TDHS-MIS) conducted in 2015-2016 (11). It is a nationally representative household survey done by the Tanzania Bureau of Statistics and Measure DHS repeated every five years. The survey aim is to make available valid data that make it possible to measure levels, patterns and trends of demography as well as health indicators. It is a two-stage sampling design intended to provide representative estimates for the entire country, urban and rural areas in Tanzania Mainland, and for Zanzibar. The first stage involved delineation of clusters consisting of enumeration areas (EAs) from the 2012 Tanzania Population Census, followed with random selection of 608 EAs which was also representative of the 30 administrative regions constituting Tanzania. Second stage was a systematic selection of 22 households from each cluster which yielded 13,376 households.

Data was available for 13,266 women 15-49 years of age including pregnant women from the selected households. Data for pregnant women respondents was extracted, cleaned and then analyzed. Data was extracted if one slept under a bed net during the previous night to the day of interview of which the response was no or yes. Those who responded yes were asked

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whether the net was treated or not treated. Consequently, the dependent variable was given a value of "1" if the pregnant woman had responded affirmatively to have slept under a treated bed net last night or else it was "0". Independent variables included the place of residence, education of mother and spouse, household characteristics including wealth, ownership of mobile phones, reading newspaper, owning radio and insurance enrolment. Hence data constituting of all pregnant women and the selected independent variables was also extracted for the analysis.

Analysis of the extracted data whose design was complex, hence it was weighted to compensate for the design and sampling bias. This was followed by the calculation of frequency distributions of the respondents by all dependent and independent variables. Ordinal and nominal variables were converted to convenient groups, binary variables were converted to yes or no and were consequently coded "0" and "1". The dependent variable was categorized as "1" if the woman used treated bed net and "0" if she did not.

In this analysis the proportion of pregnant woman who used a treated bed net was 55.7% a condition under which measure of association might be overestimated. However, in a cross-sectional study when the prevalence of the outcome is high logistic regression overestimates the measure of exposure effect hence an alternative should be used. An alternative could be Cox or Poisson regression with robust variance or log-binomial regression that provides a correct estimate (12). Hence in this analysis, log-binomial regression was used to determine the association of independent variables and sleeping under a treated bed net last night and the significance level was set at a p-value of 0.05 using STATA 12 software(13)

Then bivariate analysis was done to assess the crude odds ratio (CRO) of association of each of the selected independent variables and pregnant mothers' sleeping under a treated bed net. Those variables that in the bivariate analysis their association had p value less than 0.2 were included in a multivariate regression analysis to determine the adjusted odds ratio (AOR) of the association between independent and dependent variables. Permission to analyze the data was obtained from the DHS Program through authorization letter Auth letter187097.

Results

Table one, presents the social demographic characteristics of the study population whose total was 1137, among whom close to half 524 (46.1%) had completed primary school and just more than a quarter 292, (25.7%) resided in urban areas and 253 (22.25%) were from households in the poorest wealth quintile, most households 948 (83.4%) were headed by a male and almost half 560, (49.3%) were in the age between 20 to 29 years. Just more than a quarter (26.7%) came from household without an under five children, also most 729, (64.12%)

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had no habit of reading the magazine as a source of information, while many 584, (51.36%) came from a household with 3 or more members and most 867, (81.10%) came from households without electricity.

Table 1: Social demographic characteristics of the study population

Mother's education highest level	Characteristic	Frequency (n=1137)	Percentage (%)
	No education	203	17.85
	Incomplete primary	173	15.22
	Complete primary	524	46.09
	Incomplete secondary	89	7.83
	Secondary and higher	148	13.02
Age of mother			
	Less than 20 years	215	18.91
	20 to 29 years	560	49.25
	30 to 39 years	308	27.09
	40 and more years	54	4.75
Household wealth index			
	Poorest	253	22.25
	Poorer	214	18.82
	Middle	225	19.79
	Richer	231	20.32
	Richest	214	18.82
Sex head of household			
	Male	948	83.38
	Female	189	16.62
Place of residence			
	Urban	292	25.68
	Rural	845	74.32
Number of kids less than 5 in household			
	None	304	26.74
	One	426	37.47
	Two	253	22.25
	Three plus	154	13.54
Age of household head in years			
	Less than 25	254	22.34
	25-34	379	33.33
	35-44	236	20.76
	45 plus	268	23.57
Husband/spouse's education			
	No education	147	15.08
	Primary education	588	60.31
	Secondary education	207	21.23
	Higher education	33	3.38

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Reading of magazine			
	Not at all	729	64.12
	Less than once a week	289	25.42
	At least once a week	119	10.47
Number people in the household			
	Less than 3	125	10.99
	3 to 6 people	584	51.36
	6 plus	428	37.64
Household has electricity			
	No electricity	867	81.10
	With electricity	202	18.90

Factors associated with sleeping under ITNs among pregnant women

Just more than half (55.7%) of the pregnant women slept under a treated bed net last night and hence there has been a gap in achieving Abuja declaration target. Table 2 presents results of bivariate analysis assessing the crude odds ratio (COR) of the association of the independent variables with pregnant woman sleeping under a treated bed net. Factors crudely associated with sleeping under a treated bed net included coming from a household in the middle wealth quintile which compared to coming from the poorest households the likelihood to sleep under a treated bed net was close to 100% higher, COR =1.92, 95%CI (1.032-2.56) and those from a household with three or more children under five compared to those without any likelihood of sleeping under bed net the previous night was about three quarters higher; COR=1.74, 95%CI (1.163-2.613). In addition, coming from a household whose head was fifty or more years old compared to younger household head likelihood was 33% lower; COR=0.671, 95%CI (0.470-0.957), also if a woman came from a household without electricity likelihood to sleep under a treated bed net was 60% lower; COR=0.396 95%CI (0.137-0.937). Also, women who came from households that owned a radio compared to those with none had 40% higher likelihood of sleeping under a treated bed net COR=1.40, 95%CI (1.101-1.784) and if one had health insurance cover the likelihood of sleeping under a treated bed net was40% lower; COR=0.597, 95%CI 0.381-0.937).

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Table 2: Bivariate results analysis of the association of factors associated with sleeping under a treated bed net

		Bed net use (%)	Crude OR	95 CI interval		p-value
Mother's highest education level						
None	203	55.2	1			
Incomplete primary	173	59.5	0.999	0.659	1.512	0.966
Primary	524	56.9	1.024	0.741	1.414	0.88
Incomplete secondary	89	55.1	1.074	0.607	1.902	0.806
Secondary education and above	148	48.0	0.844	0.545	1.307	0.447
Mother's age						
Less than 20	215	53.0	1.318	1.082	1.992	0.014
20 to 29	560	57.1	1.116	0.916	1.819	0.145
30 to 39	308	55.2	0.804	0.858	2.982	0.140
40 plus	54	53.7	1			
Household wealth						
Poorest	253	51.8	1			
Poorer	214	56.5	1.297	0.913	1.842	0.47
Middle	225	61.3	1.92	1.032	2.156	0.033
Richer	231	57.8	1.382	0.961	1.985	0.081
Richest	214	51.4	1,287	0.899	1.843	0.168
Sex head of household						
Female	199	55.8	1			
Male	948	55.7	0.938	0.688	1.278	0.685
Place of residence						
Rural	292	45.5	0.889	0.689	1.148	0.367
Urban	845	43.9	1			
Reading newspaper						
Not at all	729	56.5	0.933	0.711	1.224	0.618
Less than once a week	289	54.7	0.810	0.557	1.179	0.271
At least once a week	119	52.9	1			
Number of children under 5 in household*						
None	304	49.3	1			
1	426	55.6	1.177	0.884	1.567	0.264
2	253	56.1	1.328	0.945	1.865	0.102
3 and more	154	67.5	1.743	1.163	2.613	0.007
Household head age						
Less than 30 years	254	56.7	1			
30 to 39	379	57.3	0.958	0.685	1.339	0.801
40 to 49	236	55.9	0.830	0.574	1.202	0.324
50 plus	268	52.2	0.671	0.470	0.957	0. 027
Husband/spouse education						
No education	147	55.8	1.114	0.763	1.625	0.576
Primary school	131	58.2	1.147	0.724	1.819	0.558

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Secondary education	457	53.6	1.277	0.627	2.59894	0.501
Higher education	33	48.5	1			
Number of people in a household						
Less than 3	125	52.8	1			
3 to 6	584	55.1	0.896	0.618	1.299	0.563
7 plus	428	57.2	0.967	0.656	1.426	0.866
Household has electricity						
Household has no electricity	202	57.8	0.396	0.137	0.937	0.036
Household has electricity	867	50.9	1.0			
Household has Radio						
The household has radio	545	59.82	1.402	1.101	1.784	0.006
The household has no radio	524	53.05	1			
The household has Health Insurance						
The household has health insurance	73	56.39	1			
The household has no health insurance	1064	45.21	0.597	0.381	0.937	0.025

Table 3 presents the multivariate analysis of the adjusted odds ratio (AOR) of the association of the independent variable with sleeping under a treated bed net, controlling for the confounding variables. It revealed that women from households in the richest quintile compared to the poorest had three times the likelihood of sleeping under a treated bed net AOR=3.55, 95%CI (1.26-10.02), also women from households with two or more under-five years children compared to those with none had about three times higher likelihood of sleeping under treated bed net; AOR=2.783, 95%CI(1.59-4.88), Women coming from a house without electricity compared to those having electricity their likelihood of using treated bed net was 64% less likely A0R=0.36, 95%CI(0.137-0.937), however owning a radio increased the likelihood compared to none by about 40%; AOR=1.383, 95%CI (1.03-1.85) and not having a health insurance compared to being health insured the likelihood was 58% lower; AOR=0.42(%5CI(0.24-0.75).

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Table 3: Multivariate analysis results on the factors associated with pregnant woman sleeping under treated bed net

Variable	Adjusted Odds Ratio (AOR)	95% Conf. Interval		P-value
Less than 20 years	1			
20 to 29 years	1.206	0.807	1.805	0.361
30 to 39 years	1.201	0.772	1.868	0.417
40 and more years	1.392	0.671	2.886	0.374
Wealth quintile				
Poorest	1			
Poorer	1.293	0.844	1.980	0.238
Middle	1.526	0.981	2.373	0.061
Richer	1.591	0.970	2.608	0.066
Richest	3.548	1.256	10.022	0.017
Number of under-fives in a household				
None				
1	0.986	0.686	1.416	0.939
2	1.254	0.811	1.940	0.309
3 and more	2.783	1.586	4.881	<0.001
Electricity in the Household	0.394	0.155	1.001	0.05
Have radio in the household	1.383	1.033	1.851	0.029
Has no health insurance	0.423	0.237	0.753	0.003
Husband/spouse education				
No education	1.170	0.769	1.781	0.464
Primary school	1.390	0.774	2.496	0.271
Secondary education	2.303	0.861	6.157	0.097
Higher education	1			
Mothers' education				
None	1			
Incomplete primary	0.798	0.491	1.295	0.361
Primary	0.992	0.670	1.469	0.969
Incomplete secondary	0.972	0.465	2.033	0.94
Secondary education and above	0.524	0.264	1.038	0.064

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Discussion

The study found out that despite the ongoing efforts, the use of treated bed nets among pregnant women was lower (55.5%) than what was projected by the Abuja declaration. Factors that were significantly associated with the use of treated bed nets among pregnant women included wealth, number of children less than five years in a household, where household had electricity installed, possession of radios and having been enrolled in health insurance.

The proportion of pregnant women sleeping under a treated bed net was lower (55.5%) than what was planned (60%) within the Abuja commitment, but studies elsewhere have reported even a lower proportion of pregnant women sleeping under treated bed nets (14). These studies were preceded by interventions that promoted the free nationwide distribution of treated bed nets which immediately led to the rise in the utilization of treated bed nets (15). Unfortunately, it was later followed by a decline in utilization of the bed nets which suggested providing free treated bed nets alone did not lead to a sustained rise in the sleeping under treated bed nets among pregnant women (8). Hence a need of implementation strategy that would increase sustained use of bed net especially after promotion efforts.

Mothers coming from households with better wealth index had an increased likelihood to sleep under a treated bed net the previous night. A similar relationship has been observed in studies in some other countries which also revealed that sleeping under a treated bed net increased with better household wealth (16,17). Nevertheless, the interventions to promote the ownership and the use of bed nets in some places was not paralleled with increased sleeping under a treated bed net, thus there has been a disparity in treated net campaigns, ownership and consequent use of treated bed nets the previous night (16). Thus, while treated bed nets were available freely to pregnant women and young children, it was not matched with its increased use. This gap could be explained by factors related to the inability to utilize them that prevail mostly among the poorer and less informed pregnant women. Such factors could be many or intertwined and would require implementation research approach to solve such community base implementation problems.

Our study revealed that in households with a higher number of under five years children, pregnant women were more likely to sleep under a treated bed net. Having a higher number of children could lead to a higher number of free-treated bed nets given to the households during campaigns, hence some would be available to the pregnant woman to share and also increasing the likelihood of sleeping under a treated bed net. It is also possible that with many children in a household, makes it a target for the promotion of public health interventions which could create awareness among the pregnant woman and perceive the risk and hence resort to sleeping under a treated bed net. These assertions are supported by other studies which

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observed that having a high number of children creates awareness in the utilization of bed nets. It was also agreeable that the under-fives pose a higher risk of malaria than other groups in the households (18,19). Therefore, households with a higher number of under-fives have higher probability of sleeping under treated mosquito nets in the previous night when compared to those with a lower number of under-fives. However, some other studies observed that having fewer under-five children complemented with knowledge on how malaria is transmitted and prevented, and having house sprayed in the past 12 months increased ownership and use of treated mosquito bed nets in the family (20).

Having electricity in a household would be reflecting a well-off family and a house of better quality which also reflects the ability to access better resources to control mosquitoes and thus the treated bed nets. This idea is supported by a study done in Mozambique which reported being in a house with electricity was associated with better likelihood of sleeping under a treated bed net (21). The association of electricity in households and sleeping under a treated bed net finding has also been supported by our study. That notwithstanding it has also been reported that living in a household with electricity is prone to inconsistently use of treated bed nets and likely to use them during the cold seasons and stop or irregularly utilize nets during hot seasons, hence rendering them less protective (22). Thus, a need of strategies that will enable sustained and consistent use of treated bed net despite the contexts.

The possession of radio is an important source of information that increases chances of getting information on malaria prevention and control enabling an individual to make an informed decision on the use of efficient personal protection against malaria including treated bed nets. It is also possible that benefits from owning a radio are enhanced by frequent listening to radio programs. The observations that mass media ownership in a household was associated with treated bed net use are affirmed by our study, whose findings are similar to the findings of a study recently done and reported in Ethiopia which reported that television and radios were found to be predictors of malaria and use of prevention measures in the households (23,24). This observed relationship is a testimony that mass media should be included in the strategies to enhance efforts to achieve getting back to the rollback malaria trajectory.

Being enrolled in health insurance cover was observed to be associated with a pregnant woman sleeping under a treated bed net. When someone is an insurance subscriber himself/herself or a partner has to be an employee or earning regular income in most cases, whom then would be in a better position to practice better health including sleeping under a treated bed net. Also, such people are better informed and educated than others hence the higher likelihood of sleeping under a treated bed net which is also supported by our study. Such observations are also supported by studies elsewhere that reported being a health

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insurance member health practices and consequently treated bed net use would be mediated through better information, timely access to health services and related counselling and interaction with health providers (25). Thus, to hasten going back to the rollback malaria track, it needs strategies that will merge strategies on access to media, knowledge empowerment and poverty alleviations.

Study Limitation

This study inquired about ownership and usage of bed nets by pregnant mothers and under five this depended on the understanding of the one who is responding to the questions so likelihood of overestimation and underestimation of the problem can be anticipated.

Conclusion and Recommendation

Abuja declaration gap to target was significant despite the ongoing efforts, since only 55.5% pregnant women utilized ITNs compared to 2005 Abuja 60% target and hence it has been off-track. Factors associated were wealth, fewer children in a household, electrified households, radios possession and health insurance enrolment.

Thus, it is being recommended that to hasten going back to the rollback malaria track it needs efforts that will merge strategies on access to media, knowledge empowerment and poverty alleviations along with sustained access to treated bed nets.

Ethical consideration

Permission to extract 2015-2016 DHS-MIS data and analysis was obtained from the DHS Program with letter: Auth letter187097.

Abbreviations

AOR	Adjusted odds ratio
CRO	Crude odds ratio
CI	Confidence Interval
EAs	Enumeration areas
ITN	Impregnated Treated Net
MDG	Millennium Development Goal
RBM	Roll Back Malaria
SDG	Sustainable Development Goals
TDHMIS	Tanzania Demographic Health Survey and Malaria Indicator Survey
WHO	World Health Organization

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