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Factors associated with utilization of antenatal care among rural women in Bangladesh: A community-based cross-sectional study

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ABSTRACT

Background: Despite the Government of Bangladesh's considerable efforts, utilization of antenatal care (ANC) services remains low among Bangladeshi women, notably those from rural areas. Therefore, this study aimed to assess the utilization and underlying factors affecting the utilization of ANC among women of reproductive age in rural Bangladesh.

Methods: We conducted a community-based cross-sectional study in three sub-districts of the Rangpur division, Bangladesh, from May 31, 2021, to June 9, 2021. A total of 1195 women with a live birth preceding the survey participated in the study. We used a multivariate logistic regression model to examine the association between all potential factors and the utilization of ANC4/4+ services. Multicollinearity and Hosmer-Lemeshow test was conducted to check the regression model's goodness fit test.

Results: The rate of utilization of ANC4/4+ services by women in the three sub-districts of the Rangpur division was 71.7%. Women with more age, education, having more than five members in a family, and being involved in any income-generating activities were more likely to utilize ANC4/4+ in this study.

Conclusion: The study found an insufficiency in ANC4/4+ usage, which might lead to missed opportunities for women in rural Bangladesh to have improved maternal outcomes. Particular focus should be given to women's higher education and prioritizing women's autonomy in health seeking issues in the rural women to increase the utilization of ANC4/4+.

1. Introduction

The yearly death of women from pregnancy or childbirth-related complications worldwide is approximately 300,000, and most of these cases occur in poor-resource settings and are oftentimes preventable.[1,2] One-third of maternal and child deaths occur annually in South Asian countries.[3] Appropriate frequencies and qualities of Antenatal Care (ANC) can play an essential role in preventing and lowering maternal and child mortality rates, which will be crucial to achieving this worldwide and individual nation's targets.[4–6] Besides, ANC has been considered a vital determinant for the maternal continuum of care. However, Bangladesh experiences the most drop out at this stage, followed by skilled birth attendants and postnatal care.[7] It has been demonstrated that ANC provided by professionally trained health personnel reduces pregnancy-related health complications. Stillbirths, intrauterine growth retardation, preterm births, low birth weight, fetal

Abbreviations: ANC, Ante Natal Care; BDHS, Bangladesh Demographic and Health Survey; FANC, Focused Antenatal Care; MTP, Medically Trained Providers; IOC, Item Objective Congruence.

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abnormalities, and other fetal complications may be mitigated through health promotion, disease prevention, screening, and treatment that improves maternal and newborn health survival.[2,8–11]

According to the World Health Organization's (WHO) recommended Focused Antenatal Care (FANC) Model, a woman should go for at least four ANC visits during pregnancy.[2] However, in recent times, WHO has issued the "2016 WHO ANC model" with a new series of recommendations to improve the quality of ANC, which in turn helps reduce the risk of stillbirths, and complications and ensures a positive pregnancy experience. As per this WHO 2016 model, a minimum of eight visits is recommended. The Sustainable Development Goal-3 and the WHO 2016 Antenatal Care (ANC) model both states that pregnant women must go through 4+ ANC visit to reduce maternal and child mortality.[5] The WHO 2016 ANC model provides appropriate knowledge, ready for delivery or any obstacles, and a lifesaving strategy for mother and child as it prevents the latency to care-seeking practices during obstetric emergencies that are the significant contributors to maternal mortality in a poor-resource setting.[6] Despite recommending eight visits by the recent WHO 2016 model, Bangladesh still promotes four ANC contacts due to slight time differences from the former WHO-recommended FANC model and inadequate resources.[2]

The first ANC visit within 14 weeks has increased from 40.9% to 58.6% from 1990 to 2013 worldwide.[12] However, it differs between developing and developed nations, with 48.1% and 84.8% of 4+ ANC visits, respectively, in 2013.[12] In Bangladesh, according to the recent Bangladesh Demographic and Health Surveys (BDHS), the willingness to take services from medically trained providers (MTP) has increased.[2,13,14] In Bangladesh, the ANC coverage has risen by 31% from 2004 to 2017, whereas the rates of 4+ ANC visits have increased from 17% in 2004 to 47% in 2017.[14] However, geographical and regional differences exhibit in Bangladesh. The BDHS 2017-18 data shows a minimum of one ANC by an MTP is the lowest in the Sylhet division (71%) and the highest in the Khulna division (91%). The northern region (Rajshahi-85% and Rangpur-75%) and the southeast region (Chattogram-83%) also showed a higher prevalence of at least one ANC uptake. However, this regional difference has often fluctuated over the last decade.[14]

Alongside the national survey, some other studies have been conducted in different locations in Bangladesh that determine the total number of ANC visits.[15–17] Another study identified the timing of ANC in the Northern area of Bangladesh.[2] A previous study conducted in rural Bangladesh found that women's age, number of children, husband's education and wealth index were the determinants of first timely antenatal visit.[18] However, there is a lack of evidence of the determinants of the four or more ANC visits in Northern rural areas, particularly the rural settings of the Rangpur and Nilphamari districts. Therefore, this study aimed to explore the ANC utilization and factors associated with four or more ANC visits among pregnant women from the northern rural region of Bangladesh.

2. Methods and materials

2.1. Study design, and sample size

A community-based cross-sectional study was conducted among women with at least one live birth in three years. Data were collected from three sub-districts. The sub-districts were Gangachara from the Rangpur district and Jaldhaka and Dimla from the Nilphamari district. A Non-random sampling method was used to select the participants. The **s**ample size was calculated using the formula: $n = Z^2pq/d$.[2] Here, n is the sample size. The calculated sample size was 1067, considering the confidence interval at 95% (Z = 1.96), population proportion at 50% (p = 0.5), and margin of error at 3% (d = 0.03%); The sample size was calculated with OpenEpi.[19] Finally, a total of 1195 women responded to our study, of which 643 were from, Nilphamari and 552 were from the Rangpur district.

2.2. Data collection tool

The co-authors conducted an extensive and rigorous literature review to develop the questionnaire. The criteria for the literature review were the published papers addressing rural women's determinants of utilizing ANC visits in terms of the Bangladeshi context. Initially, a pilot test was done among 40 mothers to check the feasibility of the questionnaire, and modifications were made accordingly. The index of Item Objective Congruence (IOC) was conducted to validate the questionnaire. All of the items in the questionnaire had an index of IOC value of more than 0.75 which is considered a minimum value of item acceptance.[20] The data collection tool was divided into three parts as follows: (1) consent of the participants; (2) sociodemographic data including age, educational qualification, religion, monthly income of the family, mother's involvement in any income-generating activity, occupation of husband, family size, no of under-five children living in the family, number of under-five children of the respondent; (3) antenatal care practices (3 questions) – time of first ANC checkup, place of first ANC checkup, and type of healthcare provider from whom they received ANC. Doctors, nurses, midwives, paramedics, family welfare visitors, and community-based skilled birth attendants were considered skilled providers in this study.

2.3. Study participants selection and data collection process

The location of the lactation women was collected from a reputed national non-government organization working in the study area. A total of 6651 lactating women were found in the study area. Among them, data collectors went to 2320 lactating women's homes to collect data. 337 lactating women declined to take part in the study, 479 lactating women were preoccupied with housework while the data was being collected, and 309 lactating women were relocated permanently. Finally, a total of 1195 women responded to our study, of which 643 were from, Nilphamari and 552 were from the Rangpur district [Fig. 1]. Data were collected from May 31, 2021 and June 9, 2021 through the home visit of each lactating woman by trained data collectors (research members) via face-to-face interviews with the lactating women by convenient sampling technique and monitored by two supervisors (senior research team members) daily for the consistency of the quality of data. The inclusion criteria were (a) lactating women who had at least one live birth in the previous three years, (b) lactating women who were physically fit to participate in the interview, and (c) lactating women who provided consent. Lactating women with dietary restrictions were excluded, as were lactating women who refused to provide consent.

2.4. Statistical analysis

STATA version 12.0 was used to analyze the data. Descriptive analysis was carried out to determine the frequency and percentage of the variables. A Chi-Square test was conducted to find the association between the outcome and explanatory variables. The cut-off of the *p*-value was set at $p < 0.25$ in the Chi-square test to select independent variables for logistic regression. Bivariate and multivariate logistic regression analyses were carried out to explore the association between outcome and explanatory variables. The Hosmer-Lemeshow test was conducted to test the goodness of fit of the final model. The test result was insignificant ($p = 0.54$), which indicates the final model is a good fit.[21] The correlation matrix assessed the multicollinearity of the predictors. It showed that the correlation coefficient among the predictors was less than 0.90, indicating no multicollinearity among the predictors.[22] The statistical significance level was set at 5% with a 95% confidence interval for binary logistic regression.

2.5. Ethical approval and consent to participate

This study was conducted according to the guidelines laid down in

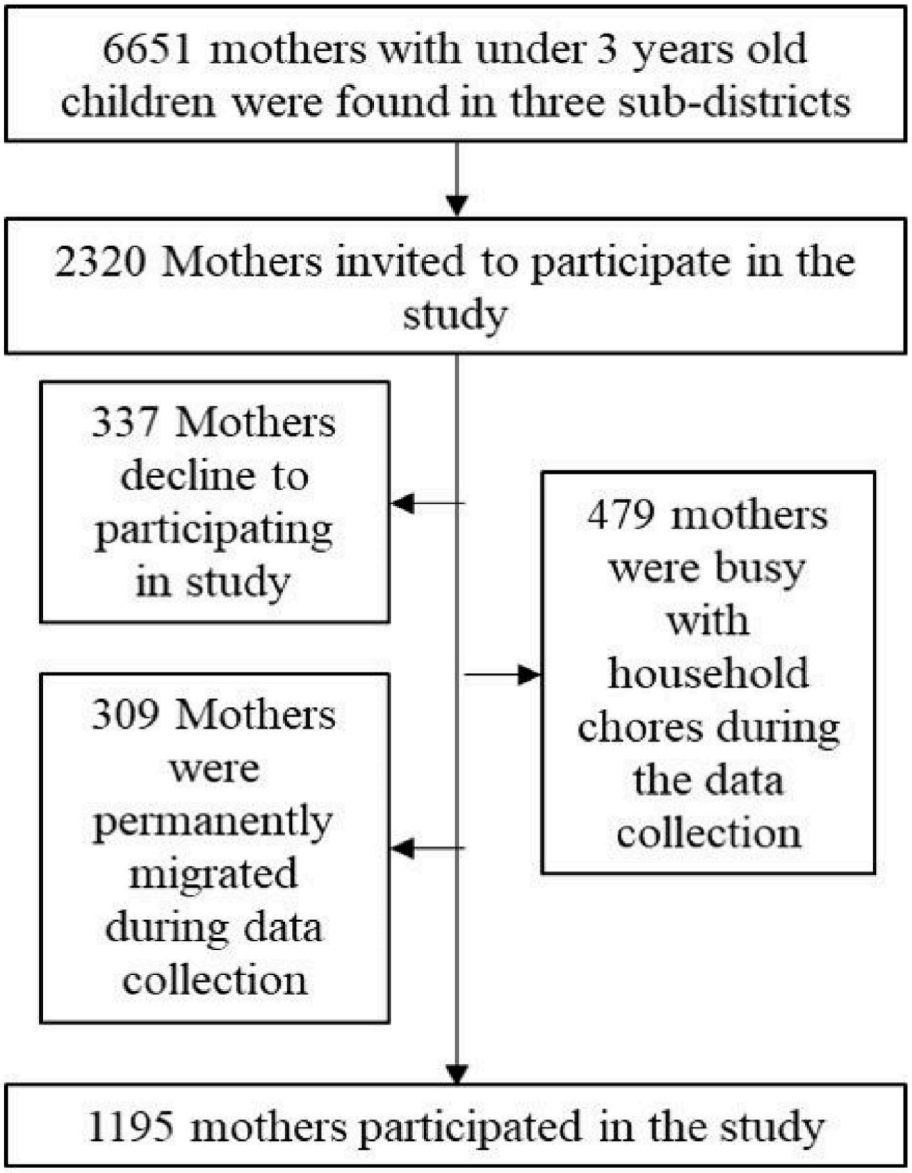

Fig. 1. Study participant selection procedure.

the Declaration of Helsinki, and all procedures involving research study participants were approved by the Institutional Review Board (IRB)/ Ethical Review Committee (ERC) of North South University. Ethical approval reference number: 2021/OR-NSU/IRB-No.0701. All the respondents who participated in this study agreed to the aforementioned informed consent statement.

3. Results

3.1. Sociodemographic results

Table 1 represents the sociodemographic status of the participants. Nearly half of the participants were aged between 25 and 34 years. More than two-thirds of the mothers had primary or higher education. Similarly, around two-thirds of the participant's husbands had primary or higher education. More than half of the family's (55.4%) monthly income ranged between 5000 and 10000 Bangladeshi Taka (BDT). Half (50.3%) of the respondent's husbands were daily workers, and one-fifth (19.3%) were farmers. Only 20.7% of mothers were involved in any income-generating activities. The majority (94.4%) of mother's religious belief was Islam. Besides, only 10% of the mothers had two or more children.

3.2. Antenatal care practices

Table 2 represents the ANC practice and utilization among the surveyed women. We found that nearly all the mothers took at least one ANC checkup, and about 71.7% of the mothers took four or more ANC checkups. However, only 13.8% of the mothers received the first ANC in one to three months of the pregnancy. More than half of the participants reported receiving their first ANC from a skilled provider, and almost all women received their first ANC visit from government facilities.

3.3. Factors associate with 4/4+ ANC visits

Table 3 represents the factors related to the utilization of 4+ ANC by the participants. The odds were 2.6, 2.8 and 1.8 times higher among who aged between 20 and 24 years [adjusted odds ratio (AOR) = 2.6, 95% CI: 1.6–4.4], 25–34 years [AOR = 2.8, 95% CI: 1.7–4.7], and above 35 years [AOR = 1.8, 95% CI: 1.0–3.4] respectively compared to women aged

Table 1
Socio-demographic characteristics of the respondents (n = 1195).

Variables Name	Frequency (n)	Percentage (%)
Age		
Below 20	89	7.4
20–24	362	30.2
25–34	585	48.9
Above 35	159	13.3
Education of the respondent		
No education	293	24.5
Primary education	537	44.9
Up to SSC*	269	22.5
HSC* and above	96	8.0
Education of the husband		
No education	444	37.1
Primary education	457	38.2
Up to SSC	164	13.7
HSC and above	130	10.8
Monthly family income in BDT [a]		
<5000	262	21.9
5000-10,000	663	55.4
10,001–15,000	178	14.9
>15,000	92	7.7
Women currently working		
No	947	79.2
Yes	248	20.7
Occupation of the husband		
Agriculture	231	19.3
Day Labor	602	50.3
Driver	66	5.5
Service Holder	111	9.2
Business	141	11.8
Others	44	3.6
Religion		
Islam	1,129	94.4
Hinduism	66	5.5
Family Size		
<5	555	46.4
≥5	640	53.5
No of under 5 Children living in the family		
<3	1,180	98.7
≥3	15	1.2
No of under 5 Children of the respondent		
<2	1,075	89.9
≥2	120	10.0

*SSC= Secondary School Certificate.
*HSC= Higher Secondary Certificate.
[a] 10,000 BDT = 118 USD.

Table 2
Antenatal Care Practices of respondents during the last pregnancy (n = 1195).

Variables Name	Frequency (n)	Percentage (%)
ANC Checkup		
None	9	0.8
1 Checkup	52	4.4
2 checkups	109	9.1
3 checkups	168	14.1
4/4+ checkups	857	71.7
Timing (months) of first antenatal care visit		
1–3	166	13.8
4–6	967	80.9
7+	62	5.1
ANC was assisted by		
Skilled[a]	696	58.2
Non-skilled	490	41.0
No ANC	9	0.7
The first ANC checkup took from		
Government facility	1,113	93.9
Non-government facility	66	5.6
Other domiciliary visits[b]	6	0.5

[a] Skilled providers include doctors, nurses, midwives, paramedics, family welfare visitors, and community-based skilled birth attendants.
[b] Skilled NGO staff in ANC care.

Table 3
Characteristics, Unadjusted and Adjusted Odds Ratios (ORs) for factors associated with getting 4/4+ ANC checkup (n = 1195).

Variable Name	Unadjusted Model			Adjusted Model		
	OR	95% CI	P Value	OR	95% CI	P Value
Age						
Below 20	Ref			Ref		
20–24	2.5	1.6–4.1	<0.001	2.6	1.6–4.4	**<0.001**
25–34	2.4	1.5–3.8	<0.001	2.8	1.7–4.7	**<0.001**
Above 35	1.5	.92–2.6	0.094	1.8	1.0–3.4	**0.033**
Education of the respondent						
No education	Ref			Ref		
Primary education	1.5	1.1–2.1	0.003	1.5	1.1–2.2	**0.008**
Up to SSC	3.4	2.3–5.1	<0.001	4.0	2.4–6.6	**<0.001**
HSC and above	6.7	3.2–13.8	<0.001	7.2	2.9–17.7	**<0.001**
Education of the husband						
No education	Ref			Ref		
Primary education	1.5	1.1–2.0	0.002	1.1	.8–1.6	0.304
Up to SSC	2.1	1.3–3.2	<.001	1.2	.7–1.9	0.488
HSC and above	3.3	1.9–5.6	<.001	1.0	.4–2.2	0.874
Monthly family income in BDT						
<5000	Ref			Ref		
5000–10,000	1.2	.9–1.7	0.134	1.0	.7–1.4	0.926
10,001–15,000	1.4	.9–2.1	0.100	.9	.5–1.5	0.793
>15,000	2.0	1.1–3.6	0.015	.9	.4–1.8	0.780
Women currently working						
Yes				Ref		
No	.8	.5–1.0	0.161	.5	.3–.7	**0.001**
Occupation of the husband						
Agriculture	Ref			Ref		
Day Labor	.9	.6–1.3	0.748	.9	.6–1.3	0.941
Driver	1.5	.7–2.8	0.208	1.6	.8–3.3	0.130
Service	2.2	1.2–4.0	0.005	1.3	.6–2.6	0.390
Business	1.6	1.0–2.6	0.048	1.2	.7–2.1	0.388
Others	1.1	.5–2.4	0.647	1.0	.4–2.2	0.919
Family size						
<5	Ref			Ref		
≥5	1.2	.9–1.6	0.094	1.4	1.0–1.9	**0.010**

CI: confidence interval.
OR: Odds Ratios.
Ref: Reference.

below 20 years. Moreover, the odds were consistently higher among who have higher secondary education or more [AOR = 7.2, 95% CI: 2.9–17.7], secondary education [AOR = 4.0, 95% CI: 2.4–6.6] and primary education [AOR = 1.5, 95% CI: 1.1–2.2] than mothers with no education. Furthermore, the odds were 1.4 times higher among women who belong to a family with five or more members [AOR = 1.4, 95% CI: 1.0–1.9] than women with less than five members. However, the odds were 0.5 times lower among women who were not involved in income-generating activities [AOR = 0.5, 95% CI: 0.3–0.7] than their counterparts.

4. Discussion

This study explored the ANC utilization and factors associated with four or more ANC visits among pregnant women from a rural region of Bangladesh. Overall, almost all the women received at least one ANC from, and about 71% of the women received at least four ANC from any provider, which was slightly higher than that of the national rate (at least one ANC = 83% and four or more ANC = 41%).[23] However, another study conducted in the country's Northern region also found almost all the women receiving at least one ANC and 78% receiving four or more ANC.[24] Nevertheless, this high uptake rate of first ANC is delayed among women. Three additional studies conducted in Bangladesh that support our findings also suggest that the uptake of the first ANC is significantly delayed[16,23,25]. However, a lack of understanding of the importance of early ANC visits, previous births with a positive outcome, traditional gender roles, fear of shame and stigma, cultural beliefs about pregnancy, spouse accompany policy, the rude

language used by health care providers, a shortage of health care providers and facilities, and the distance between health centers prevents early ANC visits.[26–29] Another study found that possible causes include maternal age, women's education, place of residence, wealth index, pregnancy intention status, child's birth order, and a desire for more children.[30] Further studies are recommended to explore the contributing factors that lead to delayed first ANC visits among these rural Northern regions of Bangladesh.

More than half of the respondents (58.2%) antenatal care checkups were assisted by skilled personnel, which was lower compared to the rural estimate (72%) from BDHS 2016.[23] Bangladesh made significant progress in improving access to healthcare by deploying community healthcare workers and establishing primary healthcare settings.[31] However, according to another study, one of the major barriers to accessing maternal care from a skilled provider in distant rural locations is a lack of human resources and the unequal distribution of geographical distribution of healthcare workers in Bangladesh. Receiving maternal health care from skilled providers or a healthcare facility is made difficult by inadequate road and transit systems in Bangladeshi rural subdistrict areas.[32]

In the current study, we discovered a substantial relationship between age and the use of ANC services, with older mothers using ANC services more frequently, which agrees with earlier research conducted in Indonesia and India.[33,34] However, maternal age showed mixed association in different studies. Some studies suggest younger women were related to more ANCs.[30,35] There's a chance that older women are more knowledgeable and aware of ANC services. On the other hand, our findings oppose those of several previous research, which found a negative relationship between age and the use of ANC services.[35]

The results of our study indicate that as maternal education increased, so did the use of ANC services. This outcome is conceivable because women who receive greater education will know more about and be more aware of ANC services. This result is in line with earlier research conducted in other low-income countries[36–39] and in rural Bangladesh,[40] but another study in Pakistan contradicts our finding.[41] However, another study in Vietnam showed that women with lower education had significant association with lower ANC checkup.[42] The capacity to manage one's household and health, as well as make decisions confidently, all improved with higher levels of schooling [36,43]. Educated mothers are more likely to have adequate knowledge about safe pregnancy and are keen to receive modern healthcare facilities. Different studies have shown that mothers with lower education are less interested in ANC services and face more difficulties receiving ANC services than mothers with higher education.[44] It is well documented that educated women are more aware of health needs, accessibility, and availability of services than illiterate.[45] Education also increases pregnancy control and enhances health-seeking behavior and awareness about the danger signs of pregnancy.[46] We found that husband's education is also a crucial determinant for the utilization of ANC among women in unadjusted model analysis, which is in line with earlier studies.[37,43] Around time, requiring children to attend free public schools from the time they are young can raise education standards all over the nation.

As was previously reported,[47] the current study also showed that working women are more likely to use ANC services. Women who are employed have better financial means to use healthcare services during pregnancy.[47] Women employed can pay for medical services, resulting in increased use of medical facilities during pregnancy.[48] We found that unemployed women were less likely to receive antenatal care and the findings showed similarity with the study based on BDHS data.[16]

This study shows that women from families with larger members were more likely to have 4/4+ ANC visits. However, other studies conducted in India[49] and Nepali[50] contradict our finding, which showed that pregnant from nuclear families had better use of antenatal services. About half of our study population belonged to a larger family, and the family size was positively related to more ANC visits. The joint family offers women a better relationship with other family members, such as mothers-in-law other than their husbands, and results in higher ANC visits.[49]

We have surveyed a more extensive population via face-to-face interviews, which is the major strength of this study. However, this particular study still has several limitations. As a cross-sectional study, we cannot conclude causality between any variables studied. Recall biases may be another notable limitation, as our study population was those with at least one live birth in the last three years. Moreover, our data were collected from rural Nilphamari and Rangpur districts; the results might not necessarily reflect service practices and costs in other districts or urban settings. Measuring family income was also a big challenge, as participants hardly wanted to express real income. Despite these drawbacks, this study gives some valuable insight into ANC practices and associated factors, which will play vital roles in designing and sustaining ANC-related interventions. Moreover, the public health researcher should focus on qualitative research to determine the stigma and cultural beliefs that prevent ANC visits. Our study showed that women's higher education increases the chances of ANC4/4+. Hence, policymakers and civil society organizations should emphasize female higher education to increase ANC4/4+ visits that these educational interventions was found effective to increase ANC visits [7]. The health care providers can also increase the numbers and quality of the ANC contents to increase the 4/4+ ANC visits [8].

5. Conclusions

The majority of the mothers got ANC from government facilities. However, almost three-quarters of mothers completed the highest number of ANC visits. Initiation of ANC was delayed among the majority of the population, and still, around half of the respondents took services from non-skilled personnel. Furthermore, the mother's higher age and higher educational qualifications have a significantly positive relationship in taking four or more ANC visits, whereas having five or more family members was the opposite.

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Data availability

Data will be available upon request from the corresponding author.

Declaration of interest

None

Author's contributions

M. W. R. N, M. M. A. S, and M. D. H. H conceived the idea of the study, developed the tool, and managed data collection, analyses, interpretation, and report writing. M. W. R. N, M. M. A. S, M. O. F, M. F. A and M. A. S assisted with tool development, data analysis, and interpretation and critically reviewed the manuscript. M. W. R. N, M. M. A. S, F. F, and S. K. M conceptualized and assisted with the study's design, tool development, data interpretation, and manuscript drafting. M. H. R assisted with critically reviewing and manuscript writing. All authors read and approved the final manuscript.

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