Utilization of antenatal care services by Sudanese women in their reproductive age

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ABSTRACT

Objectives: To describe the current antenatal care situation in Sudan with regard to routine utilization of antenatal health care services and application of tetanus toxoid (TT) vaccination in urban and rural areas.

Methods: The study was conducted in Khartoum State, Sudan, between August and December 2002. Interviews were held among a representative sample of 400 married women aged 15-49 years from both urban and rural localities. Utilization of antenatal care and TT vaccine for pregnant women were used as dependent variables while socio-economic status, place of resident, women's education, quality of care and walk-time were applied as independent variables.

Results: Utilization of routine antenatal health care services was approximately 5 times and application of TT-vaccination was 3.7 times higher in urban women as compared to women in rural areas. A higher quality of care (odds-ratio 5.8) and shorter walk-time (odds-ratio 3.1) were significantly associated with more utilization of routine antenatal care services. Mother's education showed a nearly significant positive relationship both with the use of routine antenatal health care service (odds-ratio 2.1).

Conclusion: Results suggest that public health care policy should focus on 1. developing more high quality primary health care facilities for routine antenatal care and TT-vaccination in rural areas, and 2. development and implementation of mass-media and community education for pregnant women on the need for routine antenatal care and TT-vaccination.

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A considerable variation in maternal health in the developing world is believed to be partly due to differences in the availability of and access to health services.[1] Since the mid-1980s several studies have been carried out to identify and understand why maternal health care services are under-utilized in developing countries.[2-10] The determinants of utilization of maternal health care services are not the same across socio-economic and cultural contexts.[1] Empirical studies of preventive and curative services have often found that the use of health services is related to the availability, quality and costs of services, as well as social structure, health beliefs and personal characteristics of the users.[4,11-13]

Socio-economic conditions of a household may influence health-seeking behavior.[14] Women living in worse conditions consult private health services less and rely more on governmental health services than those living in better circumstances.[15] In Sudan, urban women seem to rely more on the doctor and health visitor as antenatal care providers while rural women approach the midwife and trained traditional birth attendant (TBA) for the same purpose.[16] Since the younger and older women differ in their experience and influence, the health-seeking behavior is likely to vary between younger and older women. In general, younger women are more likely to accept modern health care, as they are likely to have greater exposure to modern medicine and have more schooling than older women.[3,7] Older women would have accumulated knowledge on maternal health care and therefore would likely have more self-confidence on pregnancy and childbirth and thus, may give less importance to obtaining institutional care.[3,7]

Evidence from previous researches suggests that maternal education has a positive effect on the use of health-care services in Africa,[17] Middle-Eastern countries,[18-19] Asia[20-22] and Latin America.[23,24] Educated women are also more likely than uneducated women to take advantage of modern

medicine and comply with recommended treatments because education changes the mother's knowledge and perception of the importance of modern medicine.[25-27] Maternal schooling reflects a higher standard of living and access to financial and other resources, as better-educated women are more likely to marry wealthier men or due to their own increased earnings.[28,29]

An important variable associated with utilization of antenatal services is the physical accessibility of these services.[19] Other studies also found that physical proximity of health care services, especially in the developing countries, plays an important role in utilization of these services.[30-32] Geographical distance was found to be one of the most important determinants of health care service utilization in rural areas.[33] Sudanese urban women seem to utilize prenatal health care much more than rural women.[16]

The objective of this study is to describe the current antenatal care situation in Sudan with regard to routine utilization of antenatal health care services and application of tetanus toxoid (TT) vaccination.

Methods. ***The study design.*** The study was a cross-sectional survey among a representative sample of 400 married (currently pregnant or in the last 2 years) women aged 15-49 years from both urban and rural localities in the State of Khartoum in Sudan with varying socio-economic, educational, employment and cultural backgrounds.

Selection of the study area and sampling. The total population of the people in Khartoum state was 5,548,784 [Central Bureau of Statistics (CBS), 2002].[34] The state composes of a total of 26 localities, 17 of them are classified as urban and 9 as rural. For the research, a total of 16 localities were selected, 12 of which were urban and 4 were rural. Localities were selected by random sampling. The sampling frame was the 2002 - total targeted women for prenatal care services in Khartoum State, Ministry of Health (pregnant women) and the total household baseline data for the 2002 population census of the CBS. The ratio of pregnant women in the State in the last year to the total population of the state for the year 2002 was considered as the study population frame.

A sample size of 400 married women from the target population was used for the study. The equation used to calculate the sample size was

$$n = \frac{Z^2\ P\ Q \times deff.}{d^2}$$

Precision P=0.5 and Q=(1-P)=0.5 was applied to carry out the sample size.

$$n = \frac{2^2 \times 0.05 \times 0.05}{0.05^2} = 400$$

Inclusion criteria were 1. being a woman between 15 and 49 years of age and 2. currently being pregnant or having been pregnant during the last 2 years. Pregnant mothers in their first trimester were excluded. The response rate for the household's questionnaire was 100%.

Conceptual framework. The hypothetical model applied in this study is based on the conceptual framework of health-seeking behavior developed by Andersen and Newman (**Figure 1**).[11,35] This behavioral model proposes that the use of health care services is a function of individual utilizer characteristics such as (i) predisposing characteristics like age, education, employment, (ii) enabling characteristics like socio-economic status (S.E.S.), and (iii) need characteristics like a healthy pregnancy; and by service accessibility

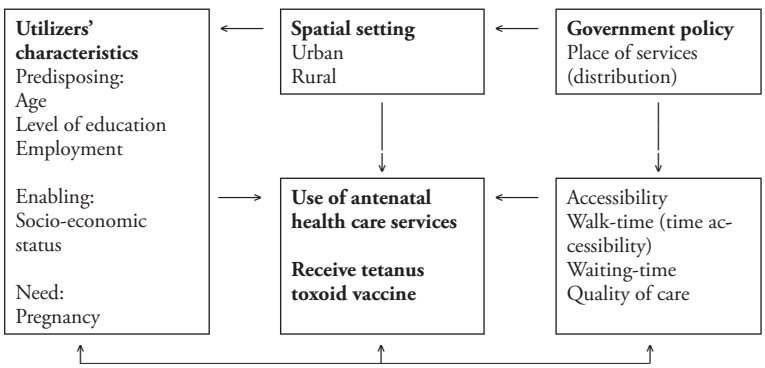

Figure 1 - Hypothetical model for the study of access and utilization of routine antenatal health care service and tetanus toxoid-vaccination[11,41]

like walking time to service, waiting time for service, quality of service; government policy like place and distribution of services; and spatial setting, like urban/rural residence.

Utilizers' predisposing and enabling characteristics are considered crucial predictors of care utilization. Individual predisposing factors reflect the fact that families with different characteristics have a different propensity to use health care services, while the enabling factors reflect the fact that some families, even if predisposed to use health services, must have some means to obtain them, such as, income, access, and availability of health services.[36]

Measurements. *Dependent variables.* Utilization of routine antenatal care was defined and measured as having had antenatal check-ups monthly starting from the second trimester. Application of TT-vaccination was scored by asking whether or not the mother had the vaccination for her present pregnancy or last pregnancy.

Independent variables. The independent variables included in the study were level of education completed, age of the women, quality of services (scored high for services delivered by a medical doctor or health visitor and low for services delivery by a traditional birth attendant (TBA), trained and untrained traditional midwife or others), spatial setting (urban/rural), location of services (institution from which respondents got services), and accessibility. Accessibility was defined as the walk-time needed to reach the nearest place of care and waiting-time before receiving the care and waiting-time before receiving check up at a visit. Socio-economic status was measured according the methods used in the Sudan Safe Motherhood Survey 1999.[16] Data were collected on ownership of durable goods. These included radio, television, refrigerator, receiver, bicycle, motorcycle, car, and tractor, type of building material of housing, fuel used for cocking, toilet, and source of water. Using factor analysis, a new variable on S.E.S. of individuals was derived and factor scores were calculated. For bivariate and logistics regression analyses factor scores were dichotomized in low and high S.E.S.

Data collection and data analysis. The data were collected in the period between August and December 2002 after collectors were trained and questionnaires were tested. Permission was taken through an official letter by Ministry of Health authorities and leaders of the public committee in each locality. Bivariate (cross-tabulation and chi-square tests, independent sample t-tests), factor analysis and logistic regression analysis were used for the analysis of data (Statistical Package for Social Sciences, version 11). Direct logistic regression analysis was used to measure the relative impact of the independent variables on both routine antenatal care service utilization and receiving TT- vaccination for last pregnancy. As a goodness-of-fit statistic the Hosmer & Lemeshow test was applied.

Results. Utilization of routine prenatal care services and TT-vaccination.

Table 1 shows the frequencies and percentages of utilization of routine antenatal care services and TT-vaccination by different background characteristics. A relatively high proportion (83.3%) of the women in the entire sample used antenatal care services whereas 77.8% of the entire sample had TT-vaccination in their last or current pregnancy. Women from urban areas, those who had a higher education, who were living closer to the health service, and who received higher quality of care (provided by a doctor or health care visitor) were more likely to have had routine antenatal care as well as had a TT-vaccination during pregnancy.

Place of care. **Tables 2** shows the places from which women got access to routine antenatal care services by different characteristics of spatial setting (urban/rural), S.E.S., quality of care, level of education and age group. Health centers were more likely used for routine antenatal care by younger mothers from a lower S.E.S background, with lower education and living in urban areas. Private clinics and public hospitals were more likely visited by highly educated, older mothers with a higher S.E.S, from urban areas while they received care from high quality care providers.

Multivariate analysis. In **Table 3** the results from the direct logistic regression analysis with routine prenatal care utilization as the dependent variable are presented. The Hosmer-Lemeshow goodness-of-fit shows a non-significant Chi squire (df 8, Chi-squire 8.691, sign.=0.387) indicating a good model fit. With all predictors included overall 88.8% of the mothers were correctly classified.

Table 3 shows that spatial setting, accessibility (walk-time), and quality of care were significant predictors of routine antenatal care service use. The odd ratio indicates that mothers from urban areas were 5.3 times more likely to use this service as compared to mothers from rural areas. Mothers that normally receive high quality care (form a medical doctor or a health visitor) are nearly 6 times more likely to utilize routine antenatal care than mothers normally receiving care form TBAs, traditional midwives, or others. Also, mothers who have a better access to health services (short walk-time to health clinic) are 3 times more likely to receive routine antenatal care then mother who have to walk 30 minutes or longer.

In **Table 4** the results of the direct logistic regression analysis for the dependent variable application of TT-vaccination are presented. The Hosmer-Lemeshow

Table 1 - Frequencies and percentage of routine antenatal care service utilization and application of tetanus toxoid (TT)-vaccination by different background characteristics (N=400).

Utilizer characteristics	N	(%)	Prenatal care				TT-vaccination			
			Use 333 (83.3%)	Do not Use 67 (16.8%)	Chi-square	*P*	Use 311 (77.8%)	Do not Use 89 (22.3%)	Chi-square	*P*
Spatial setting										
Rural	40	(10)	47.5	52.5	40.735	<0.001	40	60	36.612	<0.001
Urban	360	(90)	87.2	12.8			81.9	18.1		
Socio-economic status										
Low	186	(46.5)	79	21	5.181	<0.05	74.5	25.5	2.442	>0.05
High	214	(53.5)	87.5	12.5			81	19		
Age group										
15-30	220	(55)	85.5	14.5	1.704	>0.05	78.6	21.4	0.222	>0.05
31-45	180	(45)	80.6	19.4			76.7	23.3		
Level of education										
No and primary	179	(44.8)	76.5	23.5	10.472	≤0.001	72.1	27.9	6.048	<0.01
Secondary +	221	(55.3)	88.7	11.3			82.4	17.6		
**Quality*										
Low	88	(23)	63.6	36.4	52.344	<0.001	63.6	36.4	17.889	<0.001
High	294	(77)	93.5	6.5			84.4	15.6		
**Walk-time*										
29 – (minutes)	227	(57.6)	91.6	8.4	21.914	<0.001	85	15	14.725	<0.001
30 + (minutes)	167	(42.4)	74.3	25.7			68.9	31.1		
**Waiting-time*										
29 – (minutes)	224	(56.3)	81.7	18.3	0.79	>0.05	79	21	0.562	>0.05
30 + (minutes)	174	(43.7)	85.1	14.9			75.9	24.1		
Routine care										
Did not receive	67	(16.8)					40.3	59.7	65.253	<0.001
Received	333	(83.3)					85.3	14.7		

*(Missing: 2-18), *P* (*p*-value)

Table 2 - Places from which women got access to routine antenatal care services utilization by different characteristics.

Utilizer characteristics	(N)	Place of care (row -%)						
		Health centers	Private clinics	Public hospitals	Midwife	NGOs	Others	Did not use
Spatial setting								
Rural	40	30	2.5	10	5	0	0	52.5
Urban	360	48	16.9	17.8	2.2	1.9	0.4	12.8
S.E.S.								
Low	186	55.9	5.4	12.4	3.2	2	0.1	21
High	214	39.3	24.3	21	1.9	1.4	0.9	11.2
Age group								
15-30	220	51.8	14.5	14.5	3.4	1.4	0.4	14
31-45	180	41.1	16.7	20	1.1	2.2	0.6	18.3
Level of education								
No and primary	179	54.7	6.7	12.3	2.7	0.1	0	23.5
Secondary +	221	40.7	22.6	20.8	2.3	2.2	1.4	10
*Quality of services**								
Low	88	44.3	3.4	9.1	9	1.1	1.4	31.7
High	294	50.4	20.1	20.1	0	3	0.3	6.1

*(Missing: 0-18), NGO - non-government offices

goodness-of-fit shows a non-significant Chi squire (df 8, Chi-squire 10.400; sign.=0.238) indicating an acceptable model fit. With all predictors included overall 82.7% of the mothers were correctly classified. Two variables, spatial setting and using routine antenatal care significantly predicted application of TT-vaccination. Women from urban areas are 3.7 times more likely to get a TT-vaccination then women living in rural areas. Also, women who received antenatal care during pregnancy were nearly 4 times more likely to get a TT-vaccination, then women who did not receive antenatal care.

Subjective reasons of not receiving routine antenatal health care. Women who reported not receiving antenatal health care were asked regarding the reasons of not receiving the care. Twenty eight mothers (7%) mentioned not to go for care because of no complications, 12 (3%) said the service was not available, 9 (2.3%) reported that pregnancy was still in an early stage, 9 (2.3%) reported having (enough) previous experience with pregnancy, and 10 (2.7%) reported other reasons.

Discussion. The study established the fact that substantial regional differences exist in utilization of routine antenatal care services and TT-vaccination, with women living in rural areas being particularly disadvantaged. The observed difference between rural and urban areas in the use of services is likely to be due to differences in the availability of and access to antenatal care services in these areas. These findings confirm results from other studies that suggest that the very skewed rural-urban distribution of health care facilities is a major barrier for the use of modern medical facilities by people living in rural areas, and that efforts should be exerted to expand the availability of health care services to reach larger segments of the rural population.[37-39] Accessibility, and in particular walk-time to the nearest service facility was found to be a significant barrier before the use of routine antenatal care. For women, especially in the last pregnancy trimester, walking long distances before reaching the nearest facility is an extra burden. Other researches also showed an inverse relationship between utilization of available facilities by patients and the distance from their homes.[40] Factors interfering with distance include S.E.S. and quality of care.[41] It is suggested that people are willing to travel farther for more specialized services, or better quality care.[30] A higher quality of care (provided by doctors) was also found to be associated with more use of routine antenatal care. A high quality of care is more frequently

Table 3 - Multivariate logistic regression analysis for dependent variable of routine antenatal care service utilization with other predictors.

Predictors	OR	95.0% C.I.	*P*-value
Area			
Rural	1*		
Urban	5.32	2.19 - 12.93	0.000
Socio-economic status			
Lower	1*		
Higher	1.14	0.47 - 2.78	0.769
Age (years)			
15-30	1*		
31-45	1.43	0.67 - 3.04	0.352
Education			
No and primary	1*		
Secondary +	2.13	0.93 - 4.89	0.075
Quality of services			
Low	1*		
High	5.76	2.64 - 12.58	0.000
Accessibility: Walk-time			
29 – (minutes)	1*		
30 + (minutes)	3.09	1.43 - 6.67	0.004
Accessibility: Waiting-time			
29 – (minutes)	1*		
30 + (minutes)	1.22	0.57 - 2.59	0.606
Constant	0.04		

Table 4 - Multivariate logistic regression analysis for dependent variable application of tetanus toxoid (TT)-vaccination with other predictors.

Predictors	OR	95.0% C.I.	*P*-value
Area			
Rural	1*		
Urban	3.70	1.58 - 8.67	0.003
Socio-economic status			
Lower	1*		
Higher	1.45	0.74 - 2.86	0.283
Age (years)			
15-30	1*		
31-45	1.15	0.64 - 2.05	0.649
Education			
No and primary	1*		
Secondary +	1.49	0.78 - 2.82	0.225
Quality of services			
Low	1*		
High	1.55	0.77 - 3.12	0.222
Accessibility: Walk-time			
29 – (minutes)	1*		
30 + (minutes)	1.67	0.94 - 2.97	0.080
Accessibility: Waiting-time			
29 – (minutes)	1*		
30 + (minutes)	1.23	0.70 - 2.18	0.473
Prenatal care			
Did not use	1*		
Used	3.80	1.76 - 8.22	0.001
Constant	0.11		0.000

available in private clinics and public hospitals, which are mostly situated in urban areas.

Women with more education were more likely to visit these centers for routine antenatal care. More educated women likely had more exposure to relevant information and knowledge regarding issues related to health care.

Utilization of routine antenatal care also showed a significant positive relationship with application of TT-vaccines. Women who receive routine antenatal care check ups were more likely to obtain TT-vaccines than those who do not receive the routine check ups. This seems logical since a woman may possibly get access to the vaccine through persuasion by the antenatal health care worker during a regular antenatal care visit.

The main subjective reason for not receiving antenatal care services was the fact that no complications with the pregnancy were found. Another study also suggested that among women who received antenatal care, visits tended to be motivated by perceived health complications rather than seen as a routine requirement of pregnancy.[42] More research is needed that assesses how women perceive the antenatal health services available to them.

Certain public health policy implications emerge from this research. Firstly, since most rural respondents need to visit antenatal health care services at a walk-time of more than 30 minutes, the rural areas that are starved of accessible health facilities should receive priority attention in the provision of health centers and other health facilities. A local nearby utilization model is recommended. In primary health care centers or facilities, high quality care in terms of medical personnel and medical equipment related to antenatal care, and provisions for TT-vaccination have to be available. Secondly, since non-utilizing pregnant women relate antenatal care visits to complications with pregnancy, and not perceive these visits as a routine requirement of pregnancy, mass media programs for pregnant women emphasizing the importance of periodic health check-ups during the antenatal period need to be established. Such mass media programmes need to be complemented and enhanced with educational programmes at community level targeting pregnant women and relevant key-figures as for instance midwives and TBAs.

Limitations to the study. Although the findings seem robust, some limitations need to be mentioned. The study was cross-sectional, which does not allow for definite conclusions on the causal nature of the possible determinants of service utilization. Conclusions need to be handled with care and it is recommended that changes in policy and practice based on the results should be piloted before large-scale implementation. Another limitation was that service use (routine antenatal care utilizations and application of TT-vaccination) was measured by self-reports of the participants. However, in a related study on childhood vaccination among the same population, we checked vaccination self-reports by also asking to show the vaccination card. A very high concordance between self-report and vaccination registration was found. For antenatal care visits no validity check was feasible.

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