

Original Research Article

Patterns and Determinants of Utilization of Antenatal Care Services in Tanta, Egypt

Abstract

Background: Antenatal care (ANC) is the health care given to pregnant women, to monitor the pregnancy and reduce the risks for the mother and baby during pregnancy and at delivery. To be most effective, it is recommended that all pregnant women should have at least four antenatal checkups during pregnancy, started as early as possible in the first trimester.

Aim: The study aimed to determine the utilization pattern of antenatal care facilities and to identify the determinants of utilization of the antenatal care services in family health centers in Tanta District.

Methods: This cross-sectional study was conducted on 400 women attending four family health care facilities in Tanta city. The tools of the study were a predesigned, pretested structured questionnaire that inquire about socio-demographic data, obstetric history, medical history, the content of antenatal care program and utilization pattern, the attitude of the studied pregnant women towards ANC. Informed consent was obtained from each participant and data confidentiality was guaranteed. The data were collected through interviewing the selected women.

Results: More than half of participants (51.3%) started the first visit of ANC in their first trimester. Most of them (62.3%) received adequate ANC. Mothers in rural areas utilized ANC more than urban-ones. The age of pregnant women was significantly lower among those who received adequate ANC than those with inadequate ANC. A higher percentage of adequate ANC recipients were more educated however the difference was not statistically significant. There was

a statistically significant difference between adequacy of ANC and family income. Gravidity, parity, and children's numbers did not significantly differ according to the adequacy of ANC.

Conclusion: Age of the women, residence, obstetric complication, the way to the health facility transportation cost, transportation comfortability, the number of work hours of health care providers were the significant predictors for the determination of utilization pattern of ANC services by the studied pregnant women.

Keywords: Utilization, Antenatal care, Determinants, Pattern.

UNDER PEER REVIEW

Introduction:

Antenatal care (ANC) is the health care given to pregnant women so that they have a safe pregnancy and healthy babies. It includes routine follow-up provided to all pregnant women at the primary care level from screening to intensive life support during pregnancy and up to delivery ^[1]. The common barriers for ANC include the distance between homesteads and health facilities, cost of services, availability of services, knowledge on the availability of services, husband's approval and negative staff attitude was found to correlate with the pattern of ANC utilization ^[2].

Antenatal care from a skilled health professional is essential to monitor the pregnancy and reduce the risks for the mother and child during pregnancy and at delivery. To be most effective, it is recommended that all pregnant women should have at least four antenatal checkups during pregnancy, commencing as early as possible in the first trimester ^[3].

In a systematic review in Egypt 2014 in the samples from four studies, the proportion of women receiving ANC ranged from 33.8% to 71.4% for any ANC and 42.5% to 73.2% for ANC with a medical professional ^[4]. In Egypt, the Demographic and Health Survey (DHS) 2014 demonstrated that about 83% of pregnant women had at least four ANC visits ^[5]. The maternal mortality ratio has been diminished in Egypt from 120 in 1990 to 45 in 2013, a 62.5% reduction. Though, national data hide large discrepancies among rich and poor and urban and rural residents ^[6].

Although the ANC follow-up visits have become more frequent in Egypt than ever before. Identifying the pattern of ANC utilization is not well determined. Its identification can help policymakers for the improvement of ANC health services which in turn will improve the

pregnancy outcome, the mother, and the baby ^[7]. This was the motive behind thinking of conducting this study.

The study aimed to determine the utilization pattern of antenatal care facilities and to identify the determinants of utilization of the antenatal care services in family health centers in Tanta District.

Patients and Methods:

This cross-sectional study was carried out on 400 women who gave birth to a live baby in the last 4-6 months attending the selected facilities which were Saied Family Health Center, Damsheet family health unit, Sibribai family health unit, and Kafr Masoud family health unit, with permanent residence in the study area when they come for vaccination of their babies. The study was carried out within six months via two visits /week last 4-6 months.

Ethical consideration:

The study protocol was approved by the Ethical Committee of the faculty of Medicine at Tanta University in November 2018 (32705/11/18). Informed consent was obtained from each participant and data confidentiality was guaranteed.

The data were collected through interviewing the selected women and filling up a specially designed and pre-tested structured questionnaire.

The questionnaire inquired about socio-demographic data, medical history, past obstetric history, the attitude of the studied woman for ANC utilization, and determinants of ANC utilization.

The study tools were tested for content and face validity by a jury of four experts. The questionnaire content validity index was 92 %.

Sample size calculation

The sample size was calculated by using Epi-Info software created by the Center for Disease Prevention and Control (CDC), Atlanta, USA, version 7.2., with confidence level =95% with expected ANC utilization as 50% the least required sample size was 384 woman and increased to 400 for more accuracy of the study. A Pilot study was conducted on 40 pregnant women who were not included in the statistical analysis.

Statistical analysis:

The collected data were tabulated and analyzed using SPSS software (Statistical Package for the social sciences, version 24 SPSS Inc, Chicago ILL, USA) Categorical data were presented as numbers and percentages. The Chi-square test (X^2) was used to analyze categorical variables. Quantitative data were expressed as mean \pm standard deviation, median, and range. Student "t" test was used to analyze normally distributed variables among 2 independent groups. Regression analyses were used for the prediction of variables. The accepted level of significance in this work was stated at 0.05 ($P < 0.05$ was considered significant).

Results:

The present study found that 6.7% of the studied urban pregnant women used PHC only for ANC compared to (14.4 %) of the rural participants. While higher percentage (93.3%) of urban pregnant women used both private & PHC sectors compared to (84.8%) of rural ones with a statically significant difference in between ($p=0.033$). First trimester ANC visit was found among (44.0%) of the urban women while (56.0%) of them started at 2nd trimester compared to (55.6%) and (44.4%) among rural pregnant women respectively with statistically significant difference ($p=0.025$). About two-thirds of rural pregnant women had regular ANC (66.4%,) compared to (51.3%) of urban ones with statistically significant difference ($p=0.003$). More than half of rural pregnant women (53.6%) had five and more ANC visits compared to (31.3%) of

urban ones with statistically significant differences ($p=0.000$). The majority of urban pregnant women (98.0%) received vaccination at the health facility compared to (90.8%) of urban ones with statistically significant differences ($p=0.004$). **Table 1**

Table 1: Pattern of ANC utilization among urban and rural studied pregnant women.

Pattern of ANC utilization		The urban health center (n=150)		The rural health center (n=250)		Total	X^2 test P-value
		NO	%	NO	%		
Age among the studied pregnant women	age < 20	4	2.7	28	11.2	32 (8%)	10.7512 0.004*
	>20 - < 35	134	89.3	195	78	329 (82.2%)	
	age > 35	12	8.0	27	10.8	39 (9.7%)	
Health facility type	PHC only	10	6.7	36	14.4	46 (11.5%)	6.851 0.033*
	Private clinic	0	0.0	2	0.8	2 (0.5%)	
	Both private & PHC	140	93.3	212	84.8	352 (88%)	
Time of starting of ANC	1st trimester	66	44.0	139	55.6	205 (51%)	5.049 0.025*
	2nd trimester	84	56.0	111	44.4	195 (48.7%)	
Regularity of attendance	Regular	77	51.3	166	66.4	243 (60.7%)	8.925 0.030*
	Irregular	73	48.7	84	33.6	157 (39.2%)	
Frequency of ANC visits	Less than four	68	45.3	83	33.2	151 (37.7%)	19.591 0.000*
	Four	35	23.3	33	13.2	68 (17%)	
	Five and more	47	31.3	134	53.6	181 (45.2%)	
Vaccination	No	3	2.0	23	9.2	26 (6.5%)	7.997 0.050*
	Yes	147	98.0	227	90.8	374 (93.5%)	
Treatment	No	56	37.3	71	28.4	127 (31.7%)	3.453 0.630
	Yes	94	62.7	179	71.6	273 (68.2%)	
Sonar	No	64	42.7	95	38.0	159 (39.7%)	0.852 3560
	Yes	86	57.3	155	62.0	241 (60.2%)	

Data are presented as number (%)

Regarding do you think that ANC is important, in urban centers the percentage of women that answered "every pregnancy" was higher than those in rural centers (93.3% vs 84.4%, respectively) while (13.6%) who answered complicated pregnancy was present in rural centers than urban ones (5.3%) and the difference was statistically significant ($p=0.027$). As regards acceptance that the best facility for ANC, in rural centers the percentage of women that answered

both (PHC facility and private clinic) was higher than those in urban centers (72.4% vs 56.7%, respectively) and the difference was statistically significant ($p=0.000$). **Table 2**

Table 2: The relationship between adequacy of ANC visit and Socio-demographic characters of studied woman.

<u>Scio-demographic data</u>		Inadequate ANC (n=151)		Adequate ANC (n=249)		X^2 test P value
		NO	%	NO	%	
Residence	Urban	68	45.0	82	32.9	5.873 0.015*
	Rural	83	55.0	167	67.1	
Marital status	Married	150	99.3	249	100.0	1.633 0.199
	Divorced	1	0.7	0	0.0	
Education	Illiterate	5	3.3	5	2.0	4.836 0.305
	Read & write	5	3.3	6	2.4	
	Primary-preparatory	4	2.6	13	5.2	
	Secondary	43	28.5	89	35.7	
	University & high	94	62.3	136	54.6	
Occupation	Not working	87	57.6	167	67.1	6.773 0.148
	manual work	2	1.3	1	0.4	
	Clerk	19	12.6	19	7.6	
	Professional	42	27.8	62	24.9	
	Others	1	0.7	0	0.0	
Family income	Not enough	2	1.3	0	0.0	8.081 0.018*
	Enough & not saving	83	55.0	166	66.7	
	Enough & saving	66	43.7	83	33.3	
Type of family	Nuclear	127	84.1	197	79.1	1.521 0.218
	Extended	24	15.9	52	20.9	
Pregnant Women Age		28.35 ± 4.895		26.47 ± 4.977		0.000*
Children no		2.10 ± 1.005		2.00 ± 0.935		0.298
Family size		4.10 ± 0.998		4.03 ± 0.985		0.486
Husband Age		32.41 ± 5.453		31.41 ± 5.526		0.077

Data are presented as mean ± SD or number (%)

Pregnant women who received inadequate ANC utilized private hospitals higher than those who received adequate ANC (98.0 % vs 82.3 %, respectively), and the difference was statistically significant ($p=0.000$). Pregnant women who received adequate ANC had obstetric complications higher than those with inadequate ANC (27.3 % vs 18.5 %, respectively), and the difference was statistically significant ($p=0.047$). **Table 3**

Table 3: Relationship between adequacy of ANC visit and past obstetric history of studied pregnant women.

<u>past obstetric history</u>		Not adequate ANC (n= 151)		Adequate ANC (n=249)		X² test P value
		No.	%	No.	%	
Gravidity	1	90	59.6	166	66.7	8.492 0.131
	2 - < 5	57	37.7	72	28.9	
	>5	4	2.7	11	4.4	
Parity	1	98	64.9	180	72.3	4.027 0.402
	2 - < 5	51	33.8	67	26.9	
	>5	2	1.3	2	0.8	
Place of the last delivery	At home or on the way to a health facility	0	0.0	1	0.4	3.026 0.388
	Health center or dispensary	1	0.7	3	1.2	
	Hospital	146	96.7	243	97.6	
	Private clinic	4	2.6	2	0.8	
Hospital type	Private	148	98.0	205	82.3	22.298 0.000*
	Governmental	3	2.0	44	17.7	
Type of delivery in the last delivery	Normal vaginal Delivery	29	19.2	41	24.5	1.510 0.219
	Cesarean section	122	80.8	188	75.5	
Obstetric complications	Yes	28	18.5	68	27.3	3.960 0.047*
Abortion	NO	137	90.7	214	85.9	2.002
	YES	14	9.3	35	14.1	0.157
Low Birth weight	NO	148	98.0	243	97.6	0.076
	YES	3	2.0	6	2.4	0.782
Hyper Emesis gravidarum	NO	139	92.1	222	89.2	0.896
	YES	12	7.9	27	10.8	0.344
Eclampsia	NO	147	97.4	240	96.4	0.279
	YES	4	2.6	9	3.6	0.598
Gestational Diabetes	NO	151	100.0	246	98.8	1.833
	YES	0	0.0	3	1.2	0.176
Anemia	NO	141	93.4	224	90.0	1.375
	YES	10	6.6	52	10.0	0.241
Other complication	NO	150	99.3	249	100.0	1.653
	YES	1	0.7	0	0.0	0.199

* Data are presented as number (%)

Pregnant women who utilized both private and PHC was higher among not adequate ANC group than those who received adequate ANC (98.0% vs 81.9%, respectively) while a higher percentage (18.1 %) who utilized PHC only was present among recipients of adequate ANC than not adequate ANC group (0.7 %) and the difference was statistically significant (p=0.000).

Among adequate ANC recipients, the percentage of women whose ANC started in the 1st trimester was higher than those who received inadequate ANC (70.7 % vs 19.2 %, respectively) the difference was statistically significant (p=0.000).

Concerning regularity of attendance, inadequate ANC the percentage of women-who had regular visits was higher than those in the inadequate ANC group (91.2 % vs 10.6 %, respectively) the difference was statistically significant (p=0.000).

Among the "inadequate ANC" group, the percentage of women who had less than four visits was much higher than those in the "adequate ANC" group (100.0% vs 0.4%, respectively) while the majority (72.3 %) of adequate ANC and none of the "inadequate ANC" group had five and more visits, and the difference was statistically significant (p=0.000).

Among participants who received adequate ANC; the percentage of women who received treatment was much higher than those who received treatment in the "not adequate ANC" group (92.0% vs 29.1%, respectively), and the difference was statistically significant (p=0.000). **Table**

4

Table 4: Relationship between adequacy of ANC visits and Pattern of ANC utilization in the last pregnancy.

<u>Pattern of ANC utilization</u>		Not adequate ANC (n= 151)		Adequate ANC (n=249)		X ² test P value
		NO	%	NO	%	
Health facilities utilized for	PHC only	1	0.7	45	18.1	30.837 0.000*
	Private clinic	2	1.3	0	0.0	

ANC	Both private & PHC	148	98.0	204	81.9	
Time of starting of ANC	1st trimester	29	19.2	176	70.7	99.697 0.000*
	2nd trimester	122	80.8	73	29.3	
Regularity of attendance	Regular	16	10.6	227	91.2	255.895 0.000*
	Irregular	135	89.4	22	8.8	
Frequency of ANC visits	Less than four	151	100.0	1	0.4	395.773 0.000*
	Four	0	0.0	68	27.3	
	Five and more	0	0.0	180	72.3	
Vaccination	No	11	7.3	15	6.0	0.246 0.620
	Yes	140	92.7	234	94.0	
Treatment	No	107	70.9	20	8.0	171.233 0.000*
	Yes	44	29.1	229	92.0	
Sonar	No	107	70.9	52	20.9	98.032 0.000*
	Yes	44	29.1	197	79.1	

* Data are presented as number (%)

The residence, obstetric complications, the way to go to the health facility, transportation cost, transportation comfortability, age and the number of work hours of health care providers were the significant predictors for the determination of adequate utilization of antenatal care services ($p=0.015, 0.047, 0.000, 0.032, 0.000, 0.000, 0.029$), respectively. **Table 5**

Table 5: Logistic regression analysis of the determinants of utilization of antenatal care among participants.

Variables	Categories	Not adequate ANC	Adequate ANC	AOR	P-value	95.% C.I. for AOR	
						Lower	Upper
Independent Variables							
Residence	Urban	68	82	1.67	0.015	1.1	2.53
	Rural	83	167				
Educational level	Illiterate	5	5	1.66	0.632	0.48	5.87
	Educated	146	244				
Occupation	Not working	87	167	0.67	0.072	0.44	1.01

	Working	64	82				
Family income	Not enough	2	0				
	Enough	149	249				
Type of family	Nuclear	127	197	1.4	0.218	0.82	2.38
	Extended	24	52				
Gravidity	Gravidity < 2	90	166	0.74	0.187	0.49	1.12
	Gravity ≥ 5	61	83				
Parity	Parity ≤ 2	98	180	0.71	0.148	0.46	1.09
	Parity ≥ 5	53	69				
Obstetric complications	Yes	28	68	0.61	0.047	0.37	1
	No	123	181				
Presence of health care facility in the place of living	Yes	149	248	0.30	0.66	0.02	3.3
	No	2	1				
The way to go to the health facility	Walking	13	162	0.05	0.000	0.03	0.1
	Transportation	137	88				
Transportation Availability	Available	151	246				
	Not available	0	3				
Transportation cost	Expensive	15	2	5.29	0.032	1.18	23.72
	Not expensive	122	86				
Transportation Comfort ability	Comfortable	50	11	3.93	0.000	1.91	8.08
	Not comfortable	89	77				
Service provider dealing	Friendly	147	246	0.8	0.768	0.18	3.61
	Not friendly at all	3	4				
Privacy	There is privacy during the medical examination	148	249				
	There is no privacy	3	0				
Age				0.905	0.000	0.859	0.954
No. of children				0.701	0.437	0.287	1.715
Time walking to ANC clinic				0.870	0.514	0.573	1.321
Waiting time				1.164	0.339	0.852	1.590
Number of work hours of health care provider				1.319	0.029	1.029	1.690

*Statistically significant

Discussion

According to Egypt Demographic Health Survey (EDHS 2014), the rate of utilization of ANC has increased from 57% in 1988 to >90% in 2014 to meet the Millennium Development Goals (MDG) in the area of maternal health ^[8].

This study showed that mothers in rural areas utilized ANC more than urban ~~mothers~~-residents. This finding agreed with Tarekegn et al.^[9] who revealed that residing in the rural area made attending at least four ANC visits more likely than residing in the urban area. In contrast, utilizing ANC had been wider among urban than rural women in Egypt over the past years, and this was evident in all surveys done in Egypt throughout EDHS 2000, 2004, 2008, and 2014 ^[10]. Also, a recent study from Zagazig District, Egypt, showed that ANC utilization was higher in urban than rural populations and that large difference was linked to financial accessibility (i.e. Tickets fees, drug price, lab investigation fees, etc.) ^[11].

The current study showed that the age of pregnant women was significantly lower among the adequate ANC group than inadequate ANC group. This comes in agreement with Yeneneh et al. ^[12] who found Nigerian women aged less than 20 years were more likely to use ANC than their older counterparts.

This was in similarity with Wassif et al. ^[13] who illustrated that women aged from 19 to less than 39 years were more likely to utilize ANC if compared to those aging ≥ 39 Ys. This was in accordance with that reported by Hassan et al. ^[14] who found that mothers with adequate ANC were significantly different from those without regarding their age. Older women, on the other hand, tend to believe that maternal health care services are not necessarily due to their experiences from previous pregnancies. Also, Pandey et al.^[15] found that the lower age group were more likely to have ANC services more than four times than the women in the higher age

group and younger maternal age was a predictor of early ANC initiation in the Kuuire et al. study^[16].

This study showed that a higher percentage of adequate ANC was reported among highly educated women than low educated ones however the difference was not statistically significant.

This agreed with Ali et al.^[17] who found the level of education of pregnant women was linked to high ANC utilization. A high education level is associated with high awareness about the provided ANC services, resulting in adequate utilization. This finding is consistent with a study in Egypt which demonstrated that the probability of using ANC services was strongly influenced by the education of pregnant women and their ANC knowledge^[18]. Further, El-Zanaty and Way^[19] showed that women's education was a predictor for utilizing ANC and its regularity. The educational level within the household is one of the most powerful predictors of ANC utilization. Also, Dansou et al.^[20] reported that maternal education was a predictor of the frequency of ANC. Higher attending at least four ANC visits were more in women who had higher educational levels. Banke-Thomas et al.^[21] and Mulinge et al.^[22] reported that women's education is the most significant predictor for the utilization of maternal health services with women having a secondary and above level of education more likely to seek maternity care than those who had no education.

This study showed that there was a statistically significant difference between adequacy of ANC and family income as it was enough with adequate ANC. These results are supported by a survey conducted in rural areas in Upper Egypt (2010–11) which found that higher family income level was associated with higher receiving ANC^[4]. Further, the results of the studies done in the Philippines found that the higher family income the higher the utilization of ANC services Wong

et al. ^[23] Nisar et al. ^[24] demonstrated that income affects ANC services utilization; women of higher income were two times more likely to utilize ANC as compared to the lower-income ones. The current study found no statistically significant association between adequacy of ANC and occupation. This agreed with a study from Nigeria that reported a insignificant association between women's occupation and ANC utilization ^[25]. Also, Ali et al. ^[17] revealed no association was observed between women's occupation and the utilization of ANC services. However, these results did not match results reported in EDHS (2014) which showed higher rates of ever utilization and regular utilization of ANC among working mothers (94%) than non-workers (89.5%) ^[26]. Some studies referred to women's occupation as an empowering factor that raises her income and consequently increases her ANC utilization ^[27, 28]. The difference between results may be explained by the nature of the mother's work. If the work is for long times and with low wages, mothers will find no time to go to ANC with their limited low household income. This study found higher percentages of adequate ANC among women with low gravidity, low parity than high gravidity, parity but with no significant difference. This agreed with Onasoga et al. ^[25] who suggested that parity has no role in the utilization of ANC. In contradiction with El-Zanaty and Way ^[19] who showed that with increasing birth order of the last pregnancy, women were more likely to be reluctant to attend ANC service. High parity was perceived as a barrier to ANC utilization in some studies mothers with high parity were more likely to use ANC than those with low parity ^[27, 28]. Women with high parity or large household sizes had at least four ANC contacts in the course of pregnancy ^[29].

Our study found that concerning obstetric complications, among pregnant women who received adequate ANC; the percentage of women that had obstetric complications was higher than those

with inadequate ANC. This is to some extent similar to the results of Mulinge et al. ^[22] who found women who had obstetric complications had higher adequate ANC utilization.

This study showed that there was a statistically significant association between adequacy of ANC and utilized governmental hospitals as it was higher in women with adequate ANC. The finding is supported by findings in a study in Tanzania Adjiwanou et al. ^[30] and points to a statistically significant and positive effect of women's attendance at governmental healthcare facilities on the adequacy of ANC. This disagreed with Bayou et al. ^[31] they revealed that clients of private healthcare facilities were more likely to receive overall adequate antenatal care compared to those clients of public healthcare facilities.

This study shows that the most common determinants of utilization of antenatal care among participants were (Maternal age, obstetric complication, the way to go to health facility, transportation cost, transportation Comfortability, rural residence, education, and working hours of health care providers). Similarly, Ye et al. ^[32] found that significant predictors of ANC utilization) were: level of education (OR = 6.8, 95% CI = 2.7-16.8), income (OR = 2.6, 95% CI = 1.2-5.7), distance (OR = 2.9, 95% CI = 1.1-7.6), availability of public transportation (OR = 4.5, 95% CI = 2.0-10.4), cost of transportation (OR = 2.5, 95% CI = 1.1-5.7), and cost of service (OR = 4.6, 95% CI = 2.2-9.6). Education has been reported as one of the key social determinants of health and healthcare and women with low levels of education usually have less knowledge about ANC and poor access to the service ^[33].

A facility-based study in Addis Ababa has shown that women with planned pregnancies were more likely to book ANC early Tariku et al. ^[34] as compared to those with unplanned pregnancies.

Other studies also show that unintended pregnancies are associated with delayed initiation of antenatal care ^[35, 36]. An urban-based study shows that women who had unplanned pregnancies were less likely to attend ANC services compared to those who had planned their pregnancies by themselves or jointly with their partners ^[37].

This study showed that almost all women had the desire to use ANC services in future pregnancies as the majority of them were aware of the importance of ANC in urban and rural centers (93.3- 84.4%) respectively. This agreed with Wassif et al. ^[13] who found there was no statistically significant difference between the urban health center and the rural health center regarding the proper frequency of ANC and use of ANC again in future pregnancies.

Conclusion

The present study concluded that the age, residence, obstetric complication, the way to the health facility transportation cost, transportation comfortability, the number of work hours of health care providers were the significant predictors for the determination of utilization pattern of ANC services by the studied pregnant women.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

References

1. Solnes Miltenburg A, van der Eem L, Nyanza EC, van Pelt S, Ndaki P, Basinda N, et al. Antenatal care and opportunities for quality improvement of service provision in resource limited settings: A mixed methods study. *PLoS One*. 2017;12:188-92.
2. Simkhada B, Teijlingen ER, Porter M, Simkhada P. Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. *J Adv Nurs*. 2008;61:244-60.
3. Hill K, Thomas K, AbouZahr C, Walker N, Say L, Inoue M, et al. Estimates of maternal mortality worldwide between 1990 and 2005: an assessment of available data. *Lancet*. 2007;370:1311-9.
4. Benova L, Campbell OM, Ploubidis GB. Socio-economic gradients in maternal and child health-seeking behaviours in Egypt: systematic literature review and evidence synthesis. *PLoS One*. 2014;9:93-8.
5. Hussein YH, Said HS. Antenatal Health Care Services and Degree of Clients' Satisfaction in Sharkia Governorate, Egypt. *EFMJ*. 2020;4:77-94.
6. Gericke CA, Britain K, Elmahdawy M, Elsisy G. Health System in Egypt. In: van Ginneken E, Busse R, editors. *Health Care Systems and Policies*. New York, NY: Springer US; 2018. p. 1-19.
7. Youssef A, Khedr N, El-Kurdy R. Quality of Antenatal Care Services among Pregnant Women at Mansoura Governmental Hospitals. *Int J Nurs Stud*. 2020;7:21-8.
8. Pugliese-Garcia M, Radovich E, Hassanein N, Campbell OMR, Khalil K, Benova L. Temporal and regional variations in use, equity and quality of antenatal care in Egypt: a repeat cross-sectional analysis using Demographic and Health Surveys. *BMC Pregnancy and Childbirth*. 2019;19:268-75.

9. Tarekegn SM, Lieberman LS, Giedraitis V. Determinants of maternal health service utilization in Ethiopia: analysis of the 2011 Ethiopian Demographic and Health Survey. *BMC Pregnancy and Childbirth*. 2014;14:161-75.
10. El-Zanaty F, Way. Egypt demographic and health survey 2008 Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International 2008 [updated 2014. Available from: <https://dhsprogram.com/pubs/pdf/fr302/fr302.pdf>].
11. M. Shaheen Md H, A. Salama Md A, S. Said M.Sc H, M. Farahat Md T. Maternal health services equity between reality and imposed in Zagazig district, Sharkia Governorate, Egypt (2015/2016). *EFMJ*. 2017;1:1-12.
12. Yeneneh A, Alemu K, Dadi AF, Alamirrew A. Spatial distribution of antenatal care utilization and associated factors in Ethiopia: evidence from Ethiopian demographic health surveys. *BMC Pregnancy Childbirth*. 2018;18:242-53.
13. Wassif OM. Pattern of Utilization of Maternal Health Care Services in Qalyubia Governorate. *EJCM*. 2019;37:34-44.
14. Hassan AM. Utilization of Maternal Health Care Services Among Women in ELSheikh Zaid City. *EJCM*. 2016;34:35-49.
15. Pandey S, Karki S. Socio-economic and Demographic Determinants of Antenatal Care Services Utilization in Central Nepal. *Int J MCH AIDS*. 2014;2:212-9.
16. Kuuire VZ, Kangmennaang J, Atuoye KN, Antabe R, Boamah SA, Vercillo S, et al. Timing and utilisation of antenatal care service in Nigeria and Malawi. *Glob Public Health*. 2017;12:711-27.
17. Ali RA, Abo-Kresha SA. Patterns and Determinants of Utilization of Antenatal Care Services by Pregnant Women in Sohag, Upper Egypt. *JHIPH*. 2021;51:33-8.

18. Zaky HHM, Armanious DM, Hussein MA. Determinants of Antenatal Health Care Utilization in Egypt (2000-2014) Using Binary and Count Outcomes. *Health*. 2019;11:15-23.
19. El-Zanaty F, Way A. Egypt Demographic and Health Survey 2014 Cairo, Egypt: Ministry of Health and Population and ICF International 2014 [updated 6 September 2017. Available from: <https://dhsprogram.com/pubs/pdf/fr302/fr302.pdf>].
20. Dansou J, Adekunle AO, Arowojolu AO. Factors associated with antenatal care services utilisation patterns amongst reproductive age women in Benin Republic: An analysis of 2011/2012 benin republic's demographic and health survey data. *Niger Postgrad Med J*. 2017;24:67-74.
21. Banke-Thomas O, Banke-Thomas A, Ameh CA. Utilisation of maternal health services by adolescent mothers in Kenya: analysis of the demographic health survey 2008-2009. *Int J Adolesc Med Health*. 2016;30:54-67.
22. Mulinge N. Factors Influencing Utilization of Antenatal Care Services Among Teenage Mothers in Malindi Sub-County Kenya-A Cross Sectional Study. *SJPH*. 2017;5:61-72.
23. Wong EL, Popkin BM, Guilkey DK, Akin JS. Accessibility, quality of care and prenatal care use in the Philippines. *Soc Sci Med*. 1987;24:927-44.
24. Nisar N, White F. Factors affecting utilization of antenatal care among reproductive age group women (15-49 years) in an urban squatter settlement of Karachi. *J Pak Med Assoc*. 2003;53:47-53.
25. Onasoga OA, Afolayan JA, Oladimeji BD. Factor's influencing utilization of antenatal care services among pregnant women in Ife Central LGA, Osun State Nigeria. *Adv Appl Sci Res*. 2012;3:1309-15.

26. Islam MM, Masud MS. Determinants of frequency and contents of antenatal care visits in Bangladesh: Assessing the extent of compliance with the WHO recommendations. *PLoS One*. 2018;13:47-52.
27. Sakaya K. Analysis of Determinants of Antenatal Care Services Utilization in Nairobi County Using Logistic Regression Model. *American Journal of Theoretical and Applied Statistics*. 2015;4:322-31.
28. Gitonga E. Determinants of Focused Antenatal Care Uptake among Women in Tharaka Nithi County, Kenya. *Advances in Public Health*. 2017;7:36-54.
29. Yaya S, Uthman OA, Amouzou A, Ekholuenetale M, Bishwajit G. Inequalities in maternal health care utilization in Benin: a population based cross-sectional study. *BMC Pregnancy and Childbirth*. 2018;18:194-99.
30. Adjiwanou V, Legrand T. Does antenatal care matter in the use of skilled birth attendance in rural Africa: a multi-country analysis. *Soc Sci Med*. 2013;86:26-34.
31. Bayou YT, Mashalla YS, Thupayagale-Tshweneagae G. The adequacy of antenatal care services among slum residents in Addis Ababa, Ethiopia. *BMC Pregnancy and Childbirth*. 2016;16:142-55.
32. Ye Y, Yoshida Y, Harun-Or-Rashid M, Sakamoto J. Factors affecting the utilization of antenatal care services among women in Kham District, Xiengkhouang province, Lao PDR. *Nagoya J Med Sci*. 2010;72:23-33.
33. Long Q, Zhang T, Xu L, Tang S, Hemminki E. Utilisation of maternal health care in western rural China under a new rural health insurance system (New Co-operative Medical System). *Trop Med Int Health*. 2010;15:1210-7.

34. Tariku A, Melkamu Y, Kebede Z. Previous utilization of service does not improve timely booking in antenatal care: Cross sectional study on timing of antenatal care booking at public health facilities in Addis Ababa. *Ethiop J Health Dev.* 2010;24 56-62.
35. Dibaba Y, Fantahun M, Hindin MJ. The effects of pregnancy intention on the use of antenatal care services: systematic review and meta-analysis. *Reprod Health.* 2013;10:50-65.
36. Exavery A, Kanté AM, Hingora A, Mbaruku G, Pemba S, Phillips JF. How mistimed and unwanted pregnancies affect timing of antenatal care initiation in three districts in Tanzania. *BMC Pregnancy and Childbirth.* 2013;13:35-48.
37. MI AN, K FM, Dramaix-Wilmet M, Donnen P. Determinants of maternal health services utilization in urban settings of the Democratic Republic of Congo – A Case study of Lubumbashi City. *BMC Pregnancy and Childbirth.* 2012;12:66-9.