Assessment of Quality of Antenatal Care in Pregnant Women Delivered in Ain Shams University Hospitals

Original Article

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ABSTRACT

Background: Quality is the most important issue and the main predictor variable in developing as well as developed countries to achieve the Sustainable Development Goals (SDGs) and antenatal care.

Objective: Determination of the quality of antenatal care service and associated factors at Ain Shams University Hospital, using longitudinal study design and questionnaire form.

Methods: A total of 520 pregnant women were enrolled, after consenting each of them. Women were asked to fill the online questionnaire form give a clear answer to each item. This questionnaire defined three interconnected components of quality: structure, process, and outcomes. Deliveries outcomes were compared after the end of study. Primary outcome was assessment of the overall level quality of antenatal care service provision at Ain Shams University in comparison with other hospitals, private/public clinics and health offices. Secondary outcome was identification of the determinant factors for quality of antenatal care.

Results: No differences between study groups regarding the three components of quality of ANC. However, our study revealed that other governmental and private healthcare settings were better than Ain Shams University Maternity Hospital regarding frequency of maternal weight and blood pressure measuring during ANC, fetal assessment using ultrasound, counseling about iron and calcium intake.

Conclusion: Educational level (secondary and above) and attending regular ANC during pregnancy were significant factors associated with higher total ANC score. Caesarean section rate was higher among cases delivered at Ain Shams University Maternity Hospital that could be explained by Ain Shams Maternity University Hospital is a tertiary hospital and almost all cases delivered at it were complicated cases required urgent interventions.

Key Words: Ain Shams University Hospitals, antenatal care, pregnant women, quality.

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INTRODUCTION

Antenatal care (ANC) is the integration of maternal and fetal monitoring, preventive services and treatments, education initiatives, and help for women of childbearing age[1].

ANC was largely underappreciated until recently. There is little information available on specific ANC components. yet there was no assessment of the effects of ANC and delivery care on mothers and their newborns at the time of the study, whether in developed or poor countries[2].

Almost as much as (529,(XX)) women die per year as a consequence of risk factors associated to gestation, abortion, and delivery, according to the World Health Organization (WHO)[3].

ANC services have become more readily accessible during the last few decades. ANC coverage refers to the percentage of women in reproductive age who had at minimum one ANC session with a skilled practitioner, was around 85 percent globally and around 77 percent in the developing world between 2010 and 2015[4].

It is critical to understand mother perceptions of ANC and satisfaction with its services, as perceived quality is a significant determinant of utilization of ANC services[5].

Mothers satisfaction levels were examined using multiple characteristics such as the cleanliness of the examination space, the time it took to see a healthcare worker, the quality of services they received, and the availability of adequate information[6].

The achievement of the Millennium Development Goals (MDG) was aided by effective ANC. These are the aims specified for women to own successful pregnancies and maternal outcomes, and thus to keep today's newborns as a reserve for the next generation[7].

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These objectives were stressed in the United Nations' Sustainable Development Goals (SDGs), which were supported by global leaders[8].

AII women have the right to get recommended ANC services from a qualified attendant during their pregnancy[9].

PATIENTS AND METHODS

This retrospective study was conducted on a total of 520 pregnant women were enrolled, after consenting each of them at Obstetrics and Gynecology Department, Faculty of Medicine, Ain Shams University Maternity Hospitals from February 2021 until February 2023.

Pregnant women had an antenatal care either at Ain Shams University Maternity Hospital, other hospitals, private/public clinics or health offices and delivered at Ain Shams University Maternity Hospital.

Ethical considerations

Patient information and informed consent: before being enrolled into the study, the patient consented to participate after the nature, scope and possible consequences of the clinical study had been explained in a form understandable to her. Confidentiality: only the patient initials were recorded in the case report from, and when the patient's name appeared on any other document, it was kept in a secure place by the investigators. The investigators maintained a personal patient identification list (Patient initials with the corresponding patient names) to enable record to be identified. Concerning safety and efficacy: no evidence of harmful effects.

Study interventions and procedures

Women were asked to fill the online questionnaire form give a clear answer to each item. This questionnaire defined three interconnected components of quality: structure, process, and outcomes. Deliveries outcomes were compared after the end of study. Questionnaire: was orally recorded by investigator in Arabic and English forms. Questionnaire: according to WHO we divided it to 3 components.

Study outcomes

Primary outcome: Assessment of the overall level quality of antenatal care service provision at Ain Shams University in comparison with other hospitals, private/ public clinics or health offices.

Secondary outcome: Identification of the determinant factors for quality of antenatal care.

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS version 25). Descriptive analyses were performed to obtain the means, and deviations for quantitative data. Numbers and frequencies for qualitative data. Also, different types of graphs were used as bar, pie, box plot and error bar. Bivariate analyses were performed for normally distributed data by using the Independent samples t-test and One way ANOVA test, and the chi-squared test for categorical variables. Three scores were constructed based on WHO guidelines, the standard quality of antenatal care is comprised of three components: the first one is assessment (that is, history taking, physical examination, and laboratory tests), the second one is health promotion (that includes nutrition advice, planning the birth, information regarding pregnancy, subsequent contraception and breastfeeding, and immunization), and the last one is care provision (that is comprised of tetanus toxoid immunization, psychosocial support, and recordkeeping) (Woyessa and Ahmed, 2019). Also, a total score of ANC quality was constructed by summation of the three scores. A multiple linear regression was contacted to identify the predictors of total score of ANC quality. *P value* < 0.05 was considered significant.

RESULTS

Regarding demographic data, education level was better among cases followed up their pregnancy at other governmental and private healthcare settings compared with Ain Shams University Maternity Hospital. On the other hand, no differences were noted between study groups regarding, family income, number of previous pregnancies, abortions, normal labor, children, time and order of last pregnancy (Tables 1,2,3).

As regard different outcomes of ANC, no differences were noted between study groups regarding rates of preor post-term deliveries, fetal birth weight, maternal and neonatal postpartum complications as neonatal deaths, NICU admission and type of neonatal feeding. However, cesarean section rate was higher among cases delivered at Ain Shams University Maternity Hospital (Tables 4,5,6,7,8).

Table 1: Comparison between the studied groups according to demographic data

		Group						*P value*
		Ain Shams 48 (9.2%)		Other healthcare settings 472(90.8%)		Total 520(100%)		
		N	%	N	%	N	%	
Age	<20	3	6.3%	26	5.5%	29	5.6%	0.006*
	20-<30	14	29.2%	263	55.7%	277	53.3%	
	30-<40	28	58.3%	159	33.7%	187	36.0%	
	>=40	3	6.3%	24	5.1%	27	5.2%	
Income	<500	0	0.0%	2	0.4%	2	0.4%	0.809
	500-1000	2	4.2%	11	2.3%	13	2.5%	
	1000-2000	34	70.8%	349	73.9%	383	73.7%	
	>2000	12	25.0%	110	23.3%	122	23.5%	
Education level	illiterate	17	35.4%	72	15.3%	89	17.1%	0.002*
	Primary /preparatory	7	14.6%	146	30.9%	153	29.4%	
	Secondary	18	37.5%	192	40.7%	210	40.4%	
	university/ master	6	12.5%	62	13.1%	68	13.1%	
No of pregnancy	first	7	14.6%	112	23.7%	119	22.9%	0.088
	two	7	14.6%	93	19.7%	100	19.2%	
	three	9	18.8%	107	22.7%	116	22.3%	
	=>4	25	52.1%	160	33.9%	185	35.6%	
No of abortions	no	33	68.8%	333	70.6%	366	70.4%	0.703
	one	9	18.8%	89	18.9%	98	18.8%	
	two	3	6.3%	35	7.4%	38	7.3%	
	three	2	4.2%	6	1.3%	8	1.5%	
	=>4	1	2.1%	9	1.9%	10	1.9%	
NO of normal labor	0	26	54.2%	181	38.3%	207	39.8%	0.086
	1-2	11	22.9%	194	41.1%	205	39.4%	
	3-5	10	20.8%	88	18.6%	98	18.8%	
	>5	1	2.1%	9	1.9%	10	1.9%	
No of children	0	1	2.1%	9	1.9%	10	1.9%	0.218
	1-2	20	41.7%	243	51.5%	263	50.6%	
	3-5	27	56.3%	204	43.2%	231	44.4%	
	>5	0	0.0%	16	3.4%	16	3.1%	
Last pregnancy	1-6 Months	48	100.0%	470	99.6%	518	99.6%	0.903
	19-24 Months	0	0.0%	1	0.2%	1	0.2%	
	=>25 months	0	0.0%	1	0.2%	1	0.2%	
last pregnancy order	1-2	14	29.2%	205	43.4%	219	42.1%	0.168
	3-5	28	58.3%	217	46.0%	245	47.1%	
	>5	6	12.5%	50	10.6%	56	10.8%	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly significant, test of sig (Chi-squared test)

Table 2: Comparison between the studied groups regarding WHO Component one regarding the quality of ANC

		Group						*P value*
		Ain Shams 48 (9.2%)		Other healthcare settings 472(90.8%)		Total 520(100%)		
		N	%	N	%	N	%	
Weight measuring during ANC	No	7	14.6%	24	5.1%	31	6.0%	0.03*
	sometimes	7	14.6%	67	14.2%	74	14.2%	
	Yes	34	70.8%	381	80.7%	415	79.8%	
BP measuring during ANC	No	3	6.3%	4	0.8%	7	1.3%	0.008*
	sometimes	10	20.8%	72	15.3%	82	15.8%	
	Yes	35	72.9%	396	83.9%	431	82.9%	
Fetal heartbeats measuring during ANC	No	18	37.5%	147	31.1%	165	31.7%	0.304
	sometimes	10	20.8%	74	15.7%	84	16.2%	
	Yes	20	41.7%	251	53.2%	271	52.1%	
albumin urine analysis during ANC	No	8	16.7%	53	11.2%	61	11.7%	0.177
	sometimes	39	81.3%	378	80.1%	417	80.2%	
	Yes	1	2.1%	41	8.7%	42	8.1%	
measuring urine sugar	No	25	52.1%	182	38.6%	207	39.8%	0.068
	Yes	23	47.9%	290	61.4%	313	60.2%	
measuring blood sugar	No	10	20.8%	85	18.0%	95	18.3%	0.694
	Yes	38	79.2%	387	82.0%	425	81.7%	
The month of measuring blood sugar level	No	10	20.8%	84	17.8%	94	18.1%	0.817
	every visit	1	2.1%	14	3.0%	15	2.9%	
	In the third month of pregnancy	6	12.5%	75	15.9%	81	15.6%	
	In the fifth month of pregnancy	4	8.3%	60	12.7%	64	12.3%	
	after the fifth month	27	56.3%	239	50.6%	266	51.2%	
Hepatitis C screening	No	37	77.1%	382	80.9%	419	80.6%	0.565
	Yes	11	22.9%	90	19.1%	101	19.4%	
frequency of CBC during ANC	No	3	6.3%	22	4.7%	25	4.8%	0.866
	one	9	18.8%	81	17.2%	90	17.3%	
	two	30	62.5%	322	68.2%	352	67.7%	
	every visit	6	12.5%	47	10.0%	53	10.2%	
HIV screening	No	41	85.4%	438	92.8%	479	92.1%	0.087
	Yes	7	14.6%	34	7.2%	41	7.9%	
US during ANC	No	2	4.2%	4	0.8%	6	1.2%	0.008*
	one	2	4.2%	1	0.2%	3	0.6%	
	two	1	2.1%	9	1.9%	10	1.9%	
	three	3	6.3%	13	2.8%	16	3.1%	
	four	1	2.1%	26	5.5%	27	5.2%	
	>=5	39	81.3%	419	88.8%	458	88.1%	
4D US	No	40	83.3%	396	83.9%	436	83.8%	0.058
	one	4	8.3%	64	13.6%	68	13.1%	
	two	2	4.2%	9	1.9%	11	2.1%	
	=>3	2	4.2%	3	0.6%	5	1.0%	
CTG	no	9	18.8%	123	26.1%	132	25.4%	0.604
	sometimes stating from 7th month	7	14.6%	53	11.2%	60	11.5%	
	every visit starting from 7th month	1	2.1%	5	1.1%	6	1.2%	
	sometimes staring from 8th month	31	64.6%	285	60.4%	316	60.8%	
	every visit starting from 8th month	0	0.0%	6	1.3%	6	1.2%	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly , test of sig (Chi-squared test).

Table 3: Comparison between the studied groups regarding WHO Component two regarding the quality of ANC

		Group						*P value*
		Ain Shams 48 (9.2%)		Other healthcare settings 472(90.8%)		Total 520(100%)		
		N	%	N	%	N	%	
informed about the normal fetal movement	No	32	66.7%	343	72.7%	375	72.1%	0.377
	Yes	16	33.3%	129	27.3%	145	27.9%	
Informed about counting fetal movement in last pregnancy	No	33	68.8%	357	75.6%	390	75.0%	0.527
	Yes, ranging from 1-10	8	16.7%	67	14.2%	75	14.4%	
	yes, more than 10	7	14.6%	48	10.2%	55	10.6%	
informed about the importance of the physical activity	No	45	93.8%	439	93.0%	484	93.1%	0.847
	Yes	3	6.3%	33	7.0%	36	6.9%	
Doing physical activity /exercises	No	32	66.7%	327	69.3%	359	69.0%	0.709
	Yes	16	33.3%	145	30.7%	161	31.0%	
informed about back sleeping	No	47	97.9%	440	93.2%	487	93.7%	0.204
	Yes	1	2.1%	32	6.8%	33	6.3%	
informed about folic acid	No	4	8.3%	25	5.3%	29	5.6%	0.382
	Yes	44	91.7%	447	94.7%	491	94.4%	
informed about Omega 3	No	28	58.3%	256	54.2%	284	54.6%	0.587
	Yes	20	41.7%	216	45.8%	236	45.4%	
informed about Calcium intake	No	4	8.3%	7	1.5%	11	2.1%	0.002*
	Yes	44	91.7%	465	98.5%	509	97.9%	
Iron intake	No	4	8.3%	3	0.6%	7	1.3%	<0.001*
	Yes	44	91.7%	469	99.4%	513	98.7%	
Vitamin B12	No	20	41.7%	186	39.4%	206	39.6%	0.760
	Yes	28	58.3%	286	60.6%	314	60.4%	
Vitamin D	No	21	43.8%	254	53.8%	275	52.9%	0.225
	Yes	27	56.3%	218	46.2%	245	47.1%	
informed about the warning signs	No	17	35.4%	234	49.6%	251	48.3%	0.069
	Yes	31	64.6%	238	50.4%	269	51.7%	
informed about nutrition during pregnancy	No	5	10.4%	67	14.2%	72	13.8%	0.523
	Yes	43	89.6%	405	85.8%	448	86.2%	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly , test of sig (Chi-squared test)

Table 4: Comparison between the studied groups regarding WHO Component three regarding the quality of ANC

		Group						*P value*
		Ain Shams 48 (9.2%)		Other healthcare settings 472(90.8%)		Total 520(100%)		
		Count	Column N %	Count	Column N %	Count	Column N %	
ANC place distance	Far	5	10.4%	6	1.3%	11	2.1%	<0.001*
	nearby	26	54.2%	345	73.1%	371	71.3%	
	Not far away	17	35.4%	121	25.6%	138	26.5%	
Injection for fetal lung maturity	No	24	50.0%	235	49.8%	259	49.8%	0.03*
	Yes	24	50.0%	237	50.2%	261	50.2%	
Hospitalization in indicated	No	42	87.5%	426	90.3%	468	90.0%	0.97
	Yes	6	12.5%	46	9.7%	52	10.0%	
Tetanus vaccination during pregnancy	No	30	62.5%	248	52.5%	278	53.5%	0.542
	Yes	18	37.5%	224	47.5%	242	46.5%	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly , test of sig (Chi-squared test)

Table 5: Comparison between the studied groups regarding Quality of ANC

	Group						*P value*
	Ain Shams		Other healthcare settings		Total		
	Mean	SD	Mean	SD	Mean	SD	
Quality of ANC component one (patients assessment	18.19	4.82	19.04	3.77	18.96	3.88	0.241
	Group						
	Ain Shams		Other healthcare settings		Total		*P value*
	Mean	SD	Mean	SD	Mean	SD	
Quality of ANC component two (Health promotion services)	9.06	2.50	8.88	1.94	8.89	2.00	0.541
	Group						
	Ain Shams		Other healthcare settings		Total		*P value*
	Mean	SD	Mean	SD	Mean	SD	
Quality of ANC component three (care provision)	3.54	1.20	3.48	1.04	3.49	1.05	0.703
	Group						
	Ain Shams		Other Healthcare settings		Total		*P value*
	Mean	SD	Mean	SD	Mean	SD	
Quality of ANC total score	30.79	7.04	31.40	5.08	31.34	5.29	0.451

LOS at the incubator was >7 days for both groups

P-value > 0.05: Non significant; *P-value* < 0.05: Significant;*P-value* < 0.01: Highly , test of sig (Chi-squared test)

Table 6: Comparison between the studied groups regarding different outcomes

		Group						*P Value*
		Ain Shams 48 (9.2%)		Other healthcare settings 472(90.8%)		Total 520(100%)		
		N	%	N	%	N	%	
delivery date in weeks	preterm	22	45.8%	214	45.3%	236	45.4%	0.321
	full-term	26	54.2%	237	50.2%	263	50.6%	
	post term	0	0.0%	21	4.4%	21	4.0%	
Mode of delivery	Normal vaginal	11	22.9%	232	49.2%	243	46.7%	<0.001*
	CS	37	77.1%	240	50.8%	277	53.3%	
delivery outcome	Live newborn	43	89.6%	427	90.5%	470	90.4%	0.974
	Dead	2	4.2%	20	4.2%	22	4.2%	
	twins	3	6.3%	24	5.1%	27	5.2%	
	others	0	0.0%	1	0.2%	1	0.2%	
Birth weight	Less than a kilo	0	0.0%	1	0.2%	1	0.2%	0.510
	1-2 kilos	1	2.1%	43	9.1%	44	8.5%	
	2-3.5 kilos	33	68.8%	300	63.6%	333	64.0%	
	3-4 kilos	14	29.2%	117	24.8%	131	25.2%	
	More than 4 kilos	0	0.0%	11	2.4%	11	2.2%	
complication after delivery	No	37	77.1%	405	85.8%	442	85.0%	0.107
	Yes	11	22.9%	67	14.2%	78	15.0%	
newborn complications	No	31	64.6%	309	65.5%	340	65.4%	0.903
	Yes	17	35.4%	163	34.5%	180	34.6%	
The Newborn has been admitted to the incubator#	No	35	72.9%	339	71.8%	374	71.9%	0.872
	Yes	13	27.1%	133	28.2%	146	28.1%	
type of feeding	Mixed feeding	11	23.0%	95	21.1%	106	23.4%	0.203
	Artificial feeding	8	16.7%	39	8.3%	47	9.0%	
	Exclusive breastfeeding	29	60.4%	338	71.6%	367	70.6%	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly , test of sig t test , # ANOVA

Table 7: Association between different outcomes and ANC scores among the studied groups

		Quality of ANC component one (patients assessment)		Quality of ANC component two (Health promotion services)		Quality of ANC component three (care provision)		Quality of ANC total score	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
delivery date	preterm	19.47	3.70	8.84	2.06	3.65	1.03	31.96	5.32
	full-term	18.42	3.93	8.97	1.97	3.35	1.07	30.74	5.22
	post term	20.00	4.40	8.62	1.72	3.33	.73	31.95	5.09
#P value		0.005*		0.634		0.004*		0.031*	
Mode of delivery	Normal vaginal	18.70	4.09	8.81	1.97	3.35	.97	30.86	5.24
	CS	19.18	3.68	8.96	2.03	3.61	1.10	31.76	5.31
P value		0.159		0.397		0.004*		0.06	
delivery outcome	Live newborn	18.97	3.85	8.92	2.01	3.49	1.05	31.39	5.23
	Dead	17.55	3.69	8.36	1.92	3.05	.95	28.95	4.82
	twins	20.00	4.40	8.74	1.93	3.67	1.11	32.41	6.34
P value		0.77		0.406		0.08		0.118	
complication after delivery	No	18.96	3.90	8.89	1.98	3.49	1.04	31.34	5.27
	Yes	18.94	3.80	8.91	2.12	3.47	1.12	31.32	5.43
P value		0.953		0.939		0.912		0.971	
Newborn complications	No	18.79	3.84	8.96	2.00	3.52	1.05	31.27	5.10
	Yes	19.28	3.96	8.77	2.00	3.42	1.06	31.47	5.64
P value		0.177		0.290		0.311		0.692	
The Newborn has been admitted to the incubator	No	18.81	3.87	8.84	1.97	3.47	1.02	31.13	5.12
	Yes	19.34	3.91	9.02	2.07	3.53	1.13	31.88	5.69
P value		0.168		0.369		0.580		0.113	
type of feeding	Mixed feeding	19.17	3.35	8.68	2.07	3.41	1.04	31.26	5.06
	artificial feeding	19.40	4.74	9.34	2.11	3.72	1.28	32.47	6.54
	Exclusive breastfeeding	19.01	3.80	8.93	1.95	3.51	1.02	31.45	5.02
P value		0.04*		0.097		0.061		0.023*	

P-value > 0.05: Non significant; *P-value* < 0.05: Significant; *P-value* < 0.01: Highly , test of sig t test , # ANOVA

Table 8: Multiple regression for predictors of ANC total score

Variables (ref. group)	Beta	t	Sig.	95.0% Confidence Interval for B	
				Lower Bound	Upper Bound
Age in years	-.038-	-.893-	.372	-.103-	.039
income regression(=<2000)	.029	.692	.490	-.667-	1.392
Education level (illiterate) primary /preparatory	.072	1.249	.212	-.479-	2.148
Secondary	.171	2.926	.004	.604	3.069
university/ master	.119	2.340	.020	.300	3.441
Place of ANC (ASU)	.008	.186	.853	-1.350-	1.632
regular ANC in the last pregnancy(No)	.356	8.669	<0.001*	3.974	6.303

Adjusted R2 =0.14 F(7,520) = 13.33 , *P-value* <0.001*

DISCUSSION

Compared with WHO recommendations on antenatal care for a positive pregnancy experience, Ain Shams University had no systematic ANC program that provides adequate maternity services for pregnant women.

Regarding quality of ANC, our study revealed that there were no differences between study groups regarding the three components of quality of ANC i.e. patients assessment, health promotion services and care provision. However, our study revealed that other governmental and private healthcare settings were better than Ain Shams University Maternity Hospital regarding frequency of maternal weight and blood pressure measuring during ANC, fetal assessment using ultrasound, counseling about iron and calcium intake.

Dietary counselling of pregnant women should promote adequate calcium intake through locally available, calcium-rich foods. Dividing the dose of calcium may improve acceptability. Calcium supplementation should be 1.5-2.0 g daily, with the total amount divided into three doses, preferably taken at mealtimes.

Swain *et al* (2021) reported that through preconception care and counseling, the eligible couples will recognize, embrace, and implement the actions to improve their preconception health. Finally, it is expected that maternal and paternal health will have a significant impact on enhancing maternal nutritional status and birth outcomes[10].

Nnam (2015) reported that nutrition education should be a core component of Mother and Child Health Clinics and every opportunity should be utilised to give nutrition education on appropriate diets for pregnant women. Nutrition plays a vital role in reducing some of the health risks associated with pregnancy such as risk of fetal and infant mortality, intra-uterine growth retardation, low birth weight and premature births, decreased birth defects, cretinism, poor brain development and risk of infection. Adequate nutrition is essential for a woman throughout her life cycle to ensure proper development and prepare the reproductive life of the woman[11].

Mohamed *et al* (2022) reported that maternal micronutrient intakes including calcium, iron, vitamin D, folic acid, and niacin fell short of the national recommendations. Increased maternal fruit intake was also associated with increased birth weight. Factors associated with fetal macrosomia included high pre-pregnancy body mass index (BMI), excess gestational weight gain (GWG) and high blood glucose levels. Low pre-pregnancy BMI, inadequate GWG, intake of confectioneries and condiments, and high blood pressure were associated with low birth weight[12].

Regarding demographic data, education level was better among cases followed up their pregnancy at other governmental and private healthcare settings compared with Ain Shams University Maternity Hospital. On the other hand, no differences were noted between study groups regarding, family income, number of previous pregnancies, abortions, normal labor, children, time and order of last pregnancy.

Glick *et al* (2021) reported that pregnancy at advanced maternal age (age >35 years old) is considered a risk factor for adverse maternal and perinatal outcomes. Yet, pregnancies of advanced maternal age have become more prevalent over the last few decades. Possible maternal complications of pregnancy at age 35 or older include increased risk of spontaneous miscarriage, preterm labor, gestational diabetes mellitus, pre-eclampsia, stillbirth, chromosomal abnormalities, and cesarean delivery. Possible adverse fetal outcomes include infants small for gestational age and intrauterine growth restrictions, low Apgar score, admission to neonatal intensive care units, and an autism spectrum disorder[13].

Londero *et al* (2019) confirmed a negative impact of extreme maternal ages on pregnancy. Multivariate analysis concluded out that maternal age over 40 years was an independent risk factor for preterm delivery, pregnancy-related hypertensive disorders, GDM, cesarean section, abnormal fetal presentation and fetal PVL[14].

Larson (2007) reported that behavior problems among young children and adolescents are strongly associated with maternal poverty. During pregnancy, their mothers are likely to face multiple stressful life events, including lone-mother and teenage pregnancies, unemployment, more crowded or polluted physical environments, and far fewer resources to deal with these exposures. Included are greatly increased risks for preterm birth, intrauterine growth restriction, and neonatal or infant death. Poverty has consistently been found to be a powerful determinant of delayed cognitive development and poor school performance[15].

As regard WHO component one of quality of ANC "patients assessment", no differences were noted between study groups regarding frequency of fetal heartbeats measuring, albumin urine analysis, measuring urine and blood sugar, the month of measuring blood sugar level, frequencies of hepatitis C screening, CBC analysis, HIV screening, anomaly scan using 4D US, fetal assessment using CTG.

As regard WHO component two of quality of ANC "health promotion services", no differences were noted between study groups regarding counseling about the normal fetal movement, importance of doing physical activity /exercises, nature of fetal movement in last pregnancy, information about back sleeping, importance of folic acid, omega 3, vitamin B12 and vitamin D intake, information about the warning signs and nutrition during pregnancy.

As regard WHO component three of quality of ANC "care provision", no differences were noted between study groups regarding hospitalization of indicated or complicated cases and tetanus vaccination during pregnancy. However,

Ain Shams University Maternity was significantly far than other hospital in relation to cases houses. Corticosteroids injection for fetal lung maturity was more frequent among cases of other hospitals.

As regard different outcomes of ANC, no differences were noted between study groups regarding rates of pre- or post-term deliveries, fetal birth weight, maternal and neonatal postpartum complications as neonatal deaths, NICU admission and type of neonatal feeding. However, cesarean section rate was higher among cases delivered at Ain Shams University Maternity Hospital.

Amponsah-Tabi *et al* (2022) assessed ANC quality and its effect on adverse pregnancy outcomes among women who delivered at tertiary hospital. They agreed with us and reported that most women did not receive good quality ANC. 950 women were recruited into the study with mean age of 30.39±5.57 years. Less than one-tenth (7.6%) of the women received good quality ANC, 63.4% had average quality ANC, and 29.0% received poor quality ANC. Increasing educational level and initiating ANC in the first trimester increased the odds of receiving good quality ANC while being unemployed decreased the odds of receiving good quality ANC. Receiving poor and average quality of ANC were significantly associated with increased likelihood of developing anaemia during pregnancy, preeclampsia with severe features or delivering a low birth weight baby[16].

Alsammani *et al* (2019) reported that Young grand multiparas are less likely to develop several pregnancy complications compared to older grand multiparas women. The occurrences of intra-partum complications match that in low-risk pregnancy. Young grand multiparas have a significant risk of PPH and increased length of hospital stay => 3 days and babies born to young grand multiparas women were more likely of low birth weight and have a higher rate of admission to NICU. Young grand multiparas were similar in their maternal and fetal complication to low-risk pregnancies and significantly less in several complications when compared to older grand multiparas women[17].

Muniro *et al* (2019) also stated that grand multiparity was significantly associated with adverse pregnancy outcomes. The grand multiparous women had increased odds of prelabour rupture of membranes, stillbirth and preterm birth delivery as compared to women in the lower parity group[18].

Ali *et al* (2020) reported that women with a history of RM were twice as likely to undergo cesarean section and seven times more likely to deliver prior to 32 weeks of gestation than women without a history of RM[19].

Finally, educational level (secondary and above) and attending regular ANC during pregnancy were significant factors associated with higher total ANC score.

Kamil and Khorshid (2013) aimed to report maternal perceptions of antenatal care provision and identify deficiencies in the current model of care provision. Data analysis generated two groups. One group had up to 4 antenatal visits and the other group had more than 4 visits. Regarding follow up visits; women included in the study did not want frequent visits to antenatal clinic. However, efforts should be made to provide information about labor, breast-feeding and contraception[20].

Amponsah-Tabi *et al* (2022) assessed ANC quality and its effect on adverse pregnancy outcomes among women who delivered at Komfo Anokye Teaching Hospital. They agreed with us and reported that most women did not receive good quality ANC. High quality ANC should be provided while the women are encouraged to comply with the recommendations during ANC. 950 women were recruited into the study. Less than one-tenth (7.6%) of the women received good quality ANC, 63.4% had average quality ANC, and 29.0% received poor quality ANC. Increasing educational level and initiating ANC in the first trimester increased the odds of receiving good quality ANC while being unemployed decreased the odds of receiving good quality ANC. Receiving poor and average quality of ANC were significantly associated with increased likelihood of developing anemia during pregnancy, preeclampsia with severe features or delivering a low birth weight baby[21].

Patricia *et al* (2019) reported a similar finding of low good quality ANC. These findings suggest that although coverage of ANC is almost universal (98%), there is the need to improve the quality of care provided to women during pregnancy[22].

Consistent with the results of previous studies Enos *et al* (2021) and Wang *et al* (2015), we observed that the quality of ANC improved with increasing educational level. This could be attributed to enhanced knowledge about ANC among these groups, which make them more likely to appreciate the benefits of ANC. On the contrary we observed that women who were unemployed or employed in the informal sector and those initiating ANC late were less likely to receive good quality ANC. Women who are not employed or employed in the informal sector may have financial difficulties in accessing health care including ANC which could adversely affect the number of ANC contacts and quality. Similarly, women who initiate ANC late are also likely to have fewer visits and inadequate quality ANC[23,24].

The finding of poor or average quality ANC being associated with anaemia during pregnancy is in agreement with those of Wemakor *et al* (2019) who found poor quality ANC to be associated with anaemia in pregnancy among women receiving ANC at a tertiary referral hospital. Interestingly, the prevalence of anaemia in pregnancy also increased with the duration of the pregnancy as was observed in this study, with women starting ANC after the first trimester being at increased risk of receiving poor quality ANC compared to their counterparts who booked for ANC in the first trimester[25].

An important finding in this study is that, poor and average quality of ANC was significantly associated with preeclampsia with severe features. This is consistent with Koum *et al* (2004), who found low quality ANC was associated with preeclampsia in Cambodia. This could indicate that primary health care facilities and the human resources needed to provide ANC remain scarce. Prioritizing employee training and effective utilization of limited budgetary and human resources should be employed to expand the coverage of ANC. Training and retraining of health workers and improvement of resources in the health facilities will provide the necessary environment for quality care at the prenatal care[26].

Again, poor and average quality of ANC was significantly associated with increased likelihood of having babies with low birth weight. Similarly, previous studies Banchani and Tenkorang (2020) and other countries Wemakor *et al* (2019) and Koum *et al* (2004) highlight the association between quality of ANC and LBW. Women who receive high quality ANC including early initiation, adequate number of visits and appropriate interventions during ANC as less likely to have babies with low birth weights. It is imperative that if these women had the required number of antenatal contacts, received care from a skilled provider, and high quality clinical interventions including many of those in our quality assessment score such as health advice and information, and screening and diagnostic procedures/ tests, the incidence of low birth weight babies could have been much lower in this study[25-27].

Mohanty *et al* (2021) assessed the quality of ANC service delivery in terms of examination, screening, counselling and treatment including the adequacy in number. They disagreed with us and reported that health facility is providing better coverage of ANC services by the tertiary level service providers. Most of the routine investigations, vaccinations and necessary supplementation were in accordance with World Health Organisation (WHO) focussed ANC model[28].

Mumbare and Rege (2011), and Dasgupta *et al* (2012), also showed a positive association between the socio-economic class and utilisation of ANC services[29,30].

For instance, Roy *et al* (2013) noted that women from a poor economic background considered regular visits to healthcare settings an impediment to their daily activities. Study findings revealed that women were recommended more than four visits for ANC and it reflects their care seeking behaviour and delivery practices[31].

Paudel *et al* (2014) supported the fact that women having four or more ANC visits, are more likely to deliver at healthcare facilities and leads towards reduction in maternal and neonatal mortality along with morbidity. ANC services were being provided in that particular facility by healthcare providers with different clinical qualification and designations[32].

Matijasevich *et al* (2012) reported that mothers and infants have more adverse health outcomes if they are from poorer and less well-educated socioeconomic backgrounds. Infant outcomes were preterm birth, intra-uterine growth restriction (IUGR) and breast feeding for <3 months[33].

Schummers *et al* (2020) reported that short interpregnancy intervals appear to be associated with increased risks for adverse pregnancy outcomes for women of all ages; maternal risks at short intervals may be greater for older women, whereas fetal and infant risks may be greater for younger women. maternal mortality or severe morbidity risks were increased at short interpregnancy intervals among women 35 years or older but not for women aged 20 to 34 years; in contrast, increased risks of adverse fetal and infant outcomes and spontaneous preterm delivery were more pronounced for women aged 20 to 34 years than for those 35 years and older. Modest increases in risks of small-for-gestational-age birth and indicated preterm delivery at short intervals were not meaningfully different across maternal age groups[34].

Abbas *et al* (2017) stated that women with irregular antenatal care attendance are much more prone to pregnancy complications such as preeclampsia, eclampsia and anemia besides higher adverse birth outcomes including preterm birth, low birth weight and stillbirth[35].

Shrivastava and Malik (2018) stated that most common medical disorders with pregnancy were associated with poor pregnancy outcomes. Pregnancy induced hypertension and its complication seen in 43% of the females; followed by anaemia and hypothyroidism seen in 20% females respectively. Maximum perinatal morbidity was seen in females suffering with hypertensive disorders (53.4%), with 17(41.8%) IUGR and 6 (11.6%) intra uterine demise respectively. Following PIH, higher rate of perinatal morbidity was seen in anaemic females (50% IUGR)[36].

Meander *et al* (2021) showed that only a minority of pregnant women achieved the recommended level of physical activity, and that higher physical activity and lower sedentary time were associated with improved health outcomes. Encouraging pregnant women to increase their physical activity and decrease their sedentary time, may be important factors to improve maternal and fetal/child health outcomes. Only 27.3% of the included participants reported that they reached the recommended level of physical activity. A higher level of physical activity was associated with a reduced risk of emergency caesarean section, lower gestational weight gain, more favorable self-rated health during pregnancy, and a decreased risk of exceeding the Institute of Medicine's recommendations regarding gestational weight gain. Higher sedentary time was associated with a non-favorable self-rated health during pregnancy[37].

CONCLUSION

Compared with WHO recommendations on antenatal care for a positive pregnancy experience, Ain Shams

University had no systematic ANC program that provides adequate maternity services for pregnant women. No difference regarding total score of quality of ANC was noted between Ain Shams University Maternity Hospital and other hospitals.

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CONFLICT OF INTERESTS

There are no conflicts of interest.

REFERENCES

1. World Health Organization. (2018). WHO recommendations on antenatal care for a positive pregnancy experience: summary: highlights and key messages from the World Health Organization's 2016 global recommendations for routine antenatal care (No. WHO/RHR/18.02). World Health Organization.
2. Sönnichsen, S. D., & Clement, J. (2020). Review of green and sustainable public procurement: Towards circular public procurement. Journal of cleaner production, 245, 118901.
3. Vogel, J. P., Chawanpaiboon, S., Moller, A. B., Watananirun, K., Bonet, M., & Lumbiganon, P. (2018). The global epidemiology of preterm birth. Best Practice & Research Clinical Obstetrics & Gynaecology, 52, 3-12.
4. Elsaman, A. M., Hany, A. M., & Abdellah, A. H. (2023). Assessment of Antenatal Health Care Services and Degree of Clients Satisfaction in Qena city. SVU-International Journal of Medical Sciences, 6(1), 45-55.
5. Hijazi, H. H., Alyahya, M. S., Sindiani, A. M., Saqan, R. S., & Okour, A. M. (2018). Determinants of antenatal care attendance among women residing in highly disadvantaged communities in northern Jordan: a cross-sectional study. Reproductive health, 15(1), 1-18.
6. Fseha, B. (2019). Assessment of mothers level of satisfaction with antenatal care services provided at Alganesh Health Center Shire, North West Tigray, Ethiopia. Biomedical Journal of Scientific & Technical Research, 16(1), 11798-11802.
7. Larionova, M. (2020). The challenges of attaining the millennium development goals (MDGs). International Organisations Research Journal, 15(1), 155-176.
8. Al Nasir, A. H. A., & Abdul-Jabbar, Z. H. (2020). Risk Assessment Among Pregnant Attending Antenatal Care in Primary Health Care Centers in Al-Nasiriya City at 2018. University of Thi-Qar Journal Of Medicine, 20(2), 1-11.
9. Islam, M. M., & Masud, M. S. (2018). Determinants of frequency and contents of antenatal care visits in Bangladesh: Assessing the extent of compliance with the WHO recommendations. PloS one, 13(9), e0204752.
10. Swain, D., Begum, J., & Parida, S. P. (2021). Effect of preconception care intervention on maternal nutritional status and birth outcome in a low-resource setting: Proposal for a nonrandomized controlled trial. JMIR Research Protocols, 10(8), e28148.
11. Nnam, N. M. (2015). Improving maternal nutrition for better pregnancy outcomes. Proceedings of the Nutrition Society, 74(4), 454-459.
12. Mohamed, H. J. J., Loy, S. L., Mitra, A. K., Kaur, S., Teoh, A. N., Rahman, S. H. A., & Amarra, M. S. (2022). Maternal diet, nutritional status and infant birth weight in Malaysia: a scoping review. BMC Pregnancy and Childbirth, 22(1), 294.
13. Glick, I., Kadish, E., & Rottenstreich, M. (2021). Management of pregnancy in women of advanced maternal age: Improving outcomes for mother and baby. International journal of women's health, 751-759.
14. Londero, A. P., Rossetti, E., Pittini, C., Cagnacci, A., & Driul, L. (2019). Maternal age and the risk of adverse pregnancy outcomes: a retrospective cohort study. BMC pregnancy and childbirth, 19(1), 1-10.
15. Larson, C. P. (2007). Poverty during pregnancy: Its effects on child health outcomes. Paediatrics & child health, 12(8), 673-677.
16. Amponsah-Tabi, S., Dassah, E. T., Asubonteng, G. O., Ankobea, F., Annan, J. J., Senu, E., ... & Opare-Addo, H. S. (2022). An assessment of the quality of antenatal care and pregnancy outcomes in a tertiary hospital in Ghana. Plos one, 17(10), e0275933.
17. Alsammani, M. A., Jafer, A. M., Khieri, S. A., Ali, A. O., & Shaaeldin, M. A. (2019). Effect of grand multiparity on pregnancy outcomes in women under 35 years of age: a comparative study. Medical Archives, 73(2), 92.
18. Muniro, Z., Tarimo, C. S., Mahande, M. J., Maro, E., & Mchome, B. (2019). Grand multiparity as a predictor of adverse pregnancy outcome among women who delivered at a tertiary hospital in Northern Tanzania. BMC pregnancy and childbirth, 19, 1-8.
19. Ali, N., Elbarazi, I., Ghazal-Aswad, S., Al-Maskari, F., H Al-Rifai, R., Oulhaj, A., ... & A Ahmed, L. (2020). Impact of recurrent miscarriage on maternal outcomes in subsequent pregnancy: the mutaba ah study. International Journal of Women's Health, 1171-1179.

20. Kamil, A., & Khorshid, E. (2013). Maternal perceptions of antenatal care provision at a tertiary level hospital, Riyadh. Oman Medical Journal, 28(1), 33.

21. Amponsah-Tabi, S., Dassah, E. T., Asubonteng, G. O., Ankobea, F., Annan, J. J., Senu, E., ... & Opare-Addo, H. S. (2022). An assessment of the quality of antenatal care and pregnancy outcomes in a tertiary hospital in Ghana. Plos one, 17(10), e0275933.

22. Patricia K-M, Concepta KN, Victoria M-K, Emmanuel M, Yolan B, Muleya MC, *et al*. Evaluation of quality of antenatal care services in selected healthcare centres of Mumbwa and Lusaka districts of Zambia: Pregnant womens perspectives. International Journal of Nursing and Midwifery. 2019;11(5):32-40.

23. Enos JY, Amoako RD, Doku IK. Utilization, Predictors and Gaps in the Continuum of Care for Maternal and Newborn Health in Ghana. Int J MCH AIDS. 2021;10(1):98-108. Epub 2021/02/09. pmid:33614225.

24. Wang W, Hong R. Levels and determinants of continuum of care for maternal and newborn health in Cambodia-evidence from a population-based survey. BMC Pregnancy Childbirth. 2015;15:62. Epub 2015/04/18. pmid:25885596; PubMed Central PMCID: PMC4371879.

25. Wemakor A. Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana. BMC Pregnancy and Childbirth. 2019;19(1):495. pmid:31829146

26. Koum K, Hy S, Tiv S, Sieng T, Obara H, Matsui M, *et al*. Characteristics of antepartum and intrapartum eclampsia in the National Maternal and Child Health Center in Cambodia. Journal of Obstetrics and Gynaecology Research. 2004;30(2):74-9. pmid:15009606

27. Banchani E, Tenkorang EY. Determinants of low birth weight in Ghana: Does quality of antenatal care matter? Maternal and Child Health Journal. 2020;24(5):668-77. pmid:32026325

28. Mohanty, S., Ghadei, R., Mishra, S. S., Nayak, D., & Parida, S. (2021). Quality of Antenatal Care in a Tertiary Care Hospital of Odisha: A Cross-sectional Study. Journal of Clinical & Diagnostic Research, 15(11).

29. Mumbare SS, Rege R. Ante natal care services utilisation, delivery practices and factors affecting them in tribal area of north Maharashtra. Indian Journal of Community Medicine. 2011;36(4):287-90.

30. Dasgupta U, Naskar S, Haldar A, Mallik S. Antenatal care services utilisation and social correlates of beneficiaries: an experience from a teaching hospital of a metropolitan city. Indian Journal of Maternal and Child Health. 2012;14(2):01-08.

31. Roy MP, Mohan U, Singh SK, Singh VK, Srivastava AK. Determinants of utilisation of antenatal care services in rural Lucknow, India. J Family Med Prim Care. 2013;2:55.

32. Paudel D. Quality of antenatal care and institutional delivery practice in Nepal: Further analysis of 2011 Nepal Demographic and Health Survey. Ad Astra. 2014;5(2):29-33

33. Matijasevich, A., Victora, C. G., Lawlor, D. A., Golding, J., Menezes, A. M. B., Araujo, C. L., ... & Smith, G. D. (2012). Association of socioeconomic position with maternal pregnancy and infant health outcomes in birth cohort studies from Brazil and the UK. J Epidemiol Community Health, 66(2), 127-135.

34. Schummers, L., Hutcheon, J. A., Hernandez-Diaz, S., Williams, P. L., Hacker, M. R., VanderWeele, T. J., & Norman, W. V. (2018). Association of short interpregnancy interval with pregnancy outcomes according to maternal age. JAMA internal medicine, 178(12), 1661-1670.

35. Abbas, A. M., Rabeea, M., Hafiz, H. A. A., & Ahmed, N. H. (2017). Effects of irregular antenatal care attendance in primiparas on the perinatal outcomes: a cross sectional study. Proceedings in Obstetrics and Gynecology, 7(2).

36. Shrivastava, S., & Malik, N. (2018). Medical disorders in pregnancy and pregnancy outcome: a retrospective analysis. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 7(6), 2419-2423.

37. Meander, L., Lindqvist, M., Mogren, I., Sandlund, J., West, C. E., & Domellöf, M. (2021). Physical activity and sedentary time during pregnancy and associations with maternal and fetal health outcomes: an epidemiological study. BMC pregnancy and childbirth, 21, 1-11.