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Research Article

PHARMACOEPIDEMIOLOGICAL STUDY OF ANTENATAL CARE UTILIZATION AMONG PREGNANT WOMAN ATTENDING OBSTETRICS AND GYNECOLOGY: A COMPARATIVE STUDY OF HOSPITAL AND COMMUNITY

[*1]Rushi Naidu T, [2]Aruna Kumari C, [2]Anoohya K, [2]Sindhuja P, [2]Rohitha A and [3]Keerthi R

[1*]Avanthi institute of Pharmaceutical Sciences, Affiliated to JNTUGV, Cherukupally (V), Chittivalasa (M), Vizianagaram (Dist.) 531162
[2]Clinical Pharmacist, Anil Nerukonda Hospital, Sangivalasa, Vizianagaram (Dist), 531162
[3]Avanthi institute of Pharmaceutical Sciences, Tagarapuvalasa, Vizianagaram (Dist.) 531162

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ABSTRACT

Antenatal care is defined by the WHO as the care of pregnant mother receives before birth and involves education, screening, counselling and treatment of minor ailment and immunization services. The frequency of antenatal care utilization enhances the effectiveness of the maternal health problems to ensure maternal and child health which is evidence-based intervention. The objective of the study is to estimate the incidence and prevalence of various health care disorders and access the drug utilization patterns and treatment outcomes in both hospital and community settings during antenatal period. This Study is a Prospective, Observational, Comparative Cohort study including 300 gestational women of age 18-45 years, who received antenatal care at hospital and at Community in North coastal Andhra Pradesh for a period of 6 months. In hospital settings among 150 patient's incidences of GDM (9%), hypothyroidism (9%), anaemia (9%) followed by GHTN (7%), Pre-eclampsia (75), Oligohydramnios (7%), Placenta Previa (5%), PROM (5%), IUGR (5%), Eclampsia (3%), Polyhydramnios (3%), Dengue (3%), Ectopic pregnancy (3%), jaundice (3%), Rh-ve pregnancy (1%), comorbid conditions (18%). In Community settings among 150 patient's incidences of anaemia (13%) followed by oligohydramnios (10%), GHTN (7%), GDM (7%), hypothyroidism (7%), Placenta Previa (7%), PROM (7%), Jaundice (6%), Rh-ve pregnancy (5%), Pre-eclampsia (4%), Eclampsia (4%), Dengue (4%), IUGR (3%), Polyhydramnios (2%) and comorbid conditions (11%). In conclusion, the evaluation of data from both community and hospital settings demonstrated a positive correlation of antenatal care with health facility delivery.

Keywords: Antenatal care, Drug utilization patterns, Comorbid conditions, Ectopic pregnancy, IUGR.

INTRODUCTION

Antenatal health care is defined by the WHO as the care for a pregnant mother receives before birth, and involves education, screening, counselling, treatment of minor ailment and immunization services. Antenatal care is an umbrella term for the care of pregnant women until the child is born and is aimed at detecting any existing problems or that can develop, which could affect the mother or her unborn baby (WHO, 2016). Antenatal care is provided by the skilled health professions to pregnant women. It involves a series of medical check-ups, tests, and maternity counselling programme carried out to ensure the health of mother and child during pregnancy and child birth (National Institute for Health and Care Excellence, 2019). In developed countries, where women usually attend antenatal services early in pregnancy, the maternal and perinatal outcomes improved dramatically giving antenatal care much of the credit despite a lack of evidence for its precise benefits (WHO, 1994). In developing countries, where 80 % of the world women live, the process of pregnancy and child birth is still sometimes quite dangerous. Hence, Antenatal care is important and should begin as soon as a woman becomes pregnant and continue

*Corresponding Author: Rushi Naidu T, Assistant Professor, Avanthi institute of Pharmaceutical Sciences, affiliated to JNTUGV, Cherukupally (V), Chittivalasa (M), Vizianagaram (Dist.) 531162 Email: rushinaidu9000@gmail.com

throughout the pregnancy, which plays a crucial role in promoting a positive pregnancy experience and ensuring both the mother's and the baby's safety and health (WHO, 2016). Globally, almost 99 % of maternal deaths occur in developing countries, and approximately 830 pregnant women die every day from preventable causes related to pregnancy and child birth (WHO, 2019). In 2015, the risk of women dying from a maternal related cause in a developing country was 33 times higher than that of pregnant women living in developed countries (United Nations, 2015). Surveys from a number of developing countries done between 1980 & 1989 revealed that coverage of antenatal care ranged from 50 % to 90 % (WHO, 1994). With Antenatal care services, the global maternal mortality ratio decreased from 80 % in 1990 to 43.9 % in 2005, with an annual continuous rate of 2-3 % reduction (United Nations, 2015). The current maternal mortality ratio in India is 130, with a lifetime risk of 0.3 % (Registrar General of India, 2021).

Antenatal care visits present opportunities for reaching pregnant women with interventions that may be vital to their health and wellbeing and that of their infants. WHO recommends a minimum of 4 antenatal visits based on review of the effectiveness of difficult models of antenatal care which entails a onetime visit during the 1st trimester, a onetime visit during the 4-6 months and two visits between 7-9 months (WHO, 2002). It should be emphasized that this is only a minimum requirement and that more visits may be necessary, depending on the women condition and needs. This visit involves regular screening of health condition of both mother and foetus through various lab tests, physical examinations by skilled health professionals and detect risks and complications of pregnancy and treat or prevent them accordingly and also counsel patient to improve lifestyle.

MATERIALS AND METHODS

Study site

The Study was conducted at the Obstetrics and Gynecology Department of Maharaja Institute of Medical Sciences (MIMS) in Nellimarla, Vizianagaram and in the Community of North coastal Andhra Pradesh people.

Study design

This Study is a Prospective, Observational, Comparative Cohort study.

Study period

The study was conducted for period of 6 months

Sample population

This study 150 antenatal women from MIMS hospital and 150 antenatal women from Community in North coastal Andhra Pradesh. The study includes total of 300 subjects.

Sampling methods and recruitment

The study population were recruited through random sampling method. Women who fulfilled inclusion criteria and received antenatal care during our study period in Hospital and Community were enrolled in the study.

Hospital: $n1 = (Z1 - \frac{\alpha}{2} + Z1 - \beta)$

Sources of data collection

Data was collected from the patient Medical records and prescriptions and through direct interaction with patients who fulfilled Inclusion criteria and who provided Informed consent.

Data analysis

The prescriptions were analyzed with chief complaints of pregnant women, prevalence of the disease complication and different classes of drugs prescribed in prescription of the study population. All the documented data were evaluated and analyzed by using Microsoft Excel. The results were analyzed by using GraphPad Instant and Epi info softwares and finally interpreted and presented as tables, Pie charts and Graphs.

RESULTS AND DISCUSSION

Table No 1. Distribution of study population attending obstetrics and gynaecology department for antenatal care service in hospital and community settings according to their demographic details:

Variables	Frequency	Percentage	Mean	Median	Standard Deviation
Age					
<20	46	15%			
21-25	151	51%			
26-30	66	22%	60	46	55.3
31-35	31	10%			
>35	6	2%			
Educational Status					
Illiterates	126	42%	75	73.5	40.7

Primary Schooling	79	26%			
Secondary Schooling	68	22%			
Graduate	27	9%			
Place of Residency					
Urban	149	49.7%	150	150	1.4
Rural	151	50.3%			
Maternal Occupation					
House Wife	155	52%			
Employed	66	22%	100	79	48
Unemployed	79	26%			
Wealth Status					
Low	127	42%	100		
Moderate	110	37%		110	33.1
High	63	21%			
Maternal Weight					
Below 50	168	56%	100		
51-65	113	37%		113	75.3
Above 65	19	7%			
Knowledge of ANC					
Good	208	69%	150	150	82
Poor	92	31%			
Type of family					
Nuclear	183	61%	150	150	46.6
Joint	117	39%			
Pregnancy Related Factors					
Birth order (Gravida)					
Primi gravida	95	32%			
Bi gravida	125	42%	100	95	22.9
Multi gravida	80	26%			
Parity					
Nulliparous	95	32%			
Primiparous	125	42%	100	95	22.9
multiparous	80	26%			
No of Abortions					
0	232	77%	150	150	115.9
≥1	68	23%			
No of Stillbirth					
1	19	6%	34	34	21.2
≥1	49	16%			
Trimester					
1st Trimester	63	21%			
2nd trimester	59	20%	100	63	67.5
3rd trimester	178	59%			

Table No 2. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to their obstetric complications:

S.No	Complications	Group A (Hospital)				Group B (Community)			
		n	%	Relative Risk (RR)	Odds Ratio (OR)	n	%	Relative Risk (RR)	Odds Ratio (OR)
1	Gestational Hypertension	10	7%	2	2.11	10	7%	1.33	1.37
2	Preeclampsia	10	7%	2	2.09	6	4%	0.8	0.68
3	Gestational diabetes mellitus	13	9%	2.16	2.41	11	7%	0.87	0.96
4	Hypothyroidism	13	9%	3.5	3.69	11	7%	1.66	1.72
5	Eclampsia	5	3%	2.5	2.66	6	4%	1.33	1.30

6	Anaemia	14	9%	0.84	0.81	20	13%	1.07	1.05
7	Oligohydramnios	10	7%	2	1.87	15	10%	2	1.97
8	Polyhydramnios	4	3%	0.88	0.90	3	2%	0.80	0.77
9	Rh-ve Pregnancy	2	1%	0.2	0.19	8	5%	1.2	1.09
10	Dengue	5	3%	2.5	2.05	6	4%	2.5	3.06
11	Placenta Previa	7	5%	1.07	1.07	10	7%	2.25	2.15
12	PROM	7	5%	1.07	1.07	11	7%	1.27	1.30
13	IUGR	7	5%	2.67	2.63	5	3%	0.6	0.61
14	Ectopic pregnancy	4	3%	1.25	1.24	0	-	0	0
15	Hyperemesis gravid arum	5	3%	0.54	0.52	4	3%	1.5	2.75
16	Jaundice	4	3%	2.76	2.73	9	6%	1.95	2.01

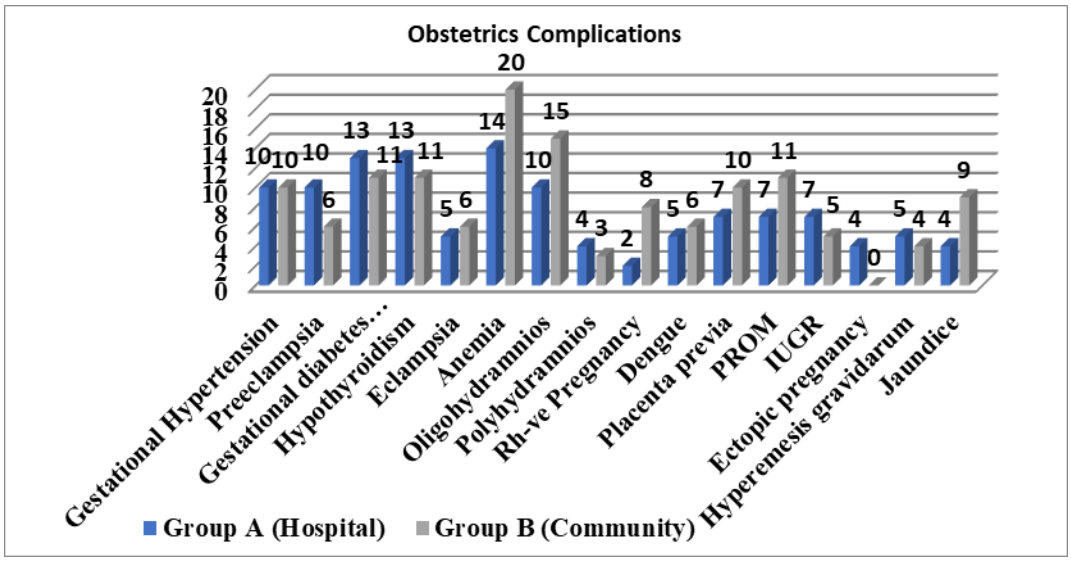

Figure 1. Obstetrics Complications.

Out of 300 study population, Both in Hospital and community settings majority of women were reported with anaemia cases with the frequency of 14 (9%) and 20 (13%) respectively, hypothyroidism 13 (9%), gestational diabetes 13 (9%) in hospital, 15 oligohydramnios (10%), 11 hypothyroidism (7%) in community settings.

Table 3. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) according to the Prevalence:

Department	**Complications**	**Hospital (Group A) Frequency**		
		3rd trimester	**2nd trimester**	**1st Trimester**
Cardiology	Gestation Hypertension	5	3	2
	Pre-eclampsia	5	0	5
Endocrinology	Hypothyroidism	5	5	3
	Gestational diabetes mellitus	9	4	0
Haematology	Severe anaemia	8	4	2
	Oligohydramnios	8	2	0
	Polyhydramnios	4	0	0
	Rh -ve Pregnancy	0	0	2

Gastroenterology	Jaundice	3	0	1
	Hyperemesis gravid arum	3	0	2
Immunology	Dengue	3	2	0
Neurology	Eclampsia	3	2	0
Gynaecology	Placenta Previa	6	1	0
	PROM	5	2	0
	IUGR	5	2	0
	Ectopic Pregnancy	2	1	1

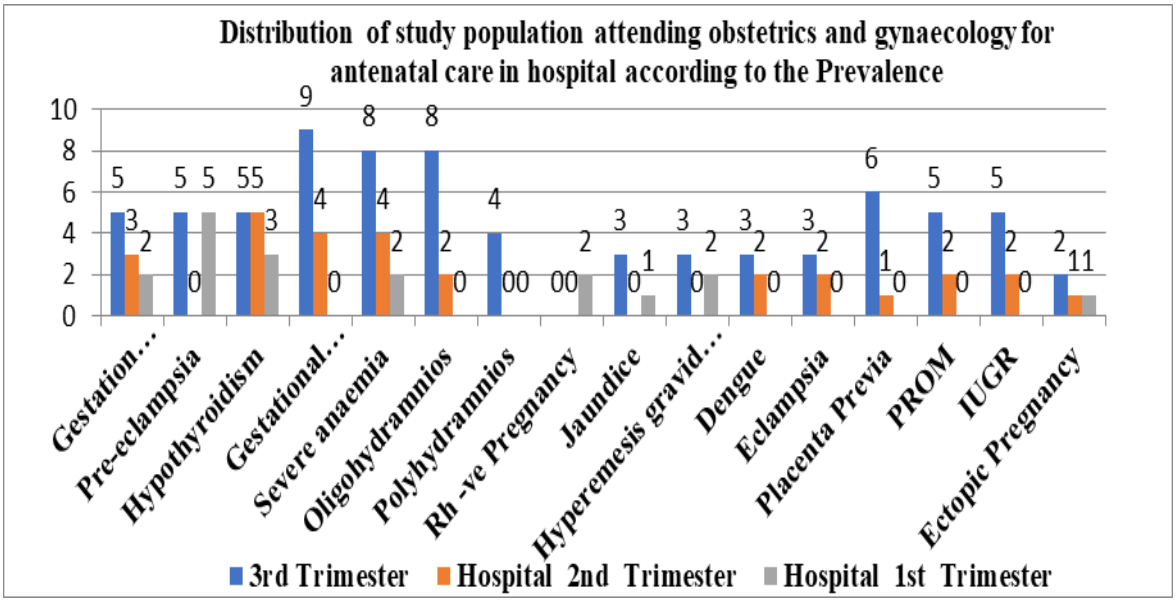

Figure 2. Distribution of study population attending obstetrics and gynaecology for antenatal care in hospital according to the Prevalence.

Out of 150 population in hospital settings, majority of women were reported with endocrine diseases, 9 gestational diabetes mellitus, 5 hypothyroidisms reported in third trimester, least number of cases reported in first trimester.

Table 4. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Community settings (Group B) according to the Prevalence.

Department	**Complications**	**Community (Group B) Frequency**		
		3rd trimester	**2nd trimester**	**1st trimester**
Cardiology	Gestation Hypertension	4	3	3
	Pre-eclampsia	4	0	2
Endocrinology	Hypothyroidism	2	5	4
	Gestational diabetes mellitus	4	3	4
Haematology	Severe anaemia	7	4	9
	Oligohydramnios	5	3	7
	Polyhydramnios	3	0	0

	Rh -ve Pregnancy	2	0	6
Gastroenterology	Jaundice	4	3	2
	Hyperemesis gravid arum	4	0	0
Immunology	Dengue	3	3	0
Neurology	Eclampsia	4	2	0
	Placenta Previa	7	3	0
Gynaecology	PROM	9	2	0
	IUGR	5	0	0
	Ectopic Pregnancy	0	0	0

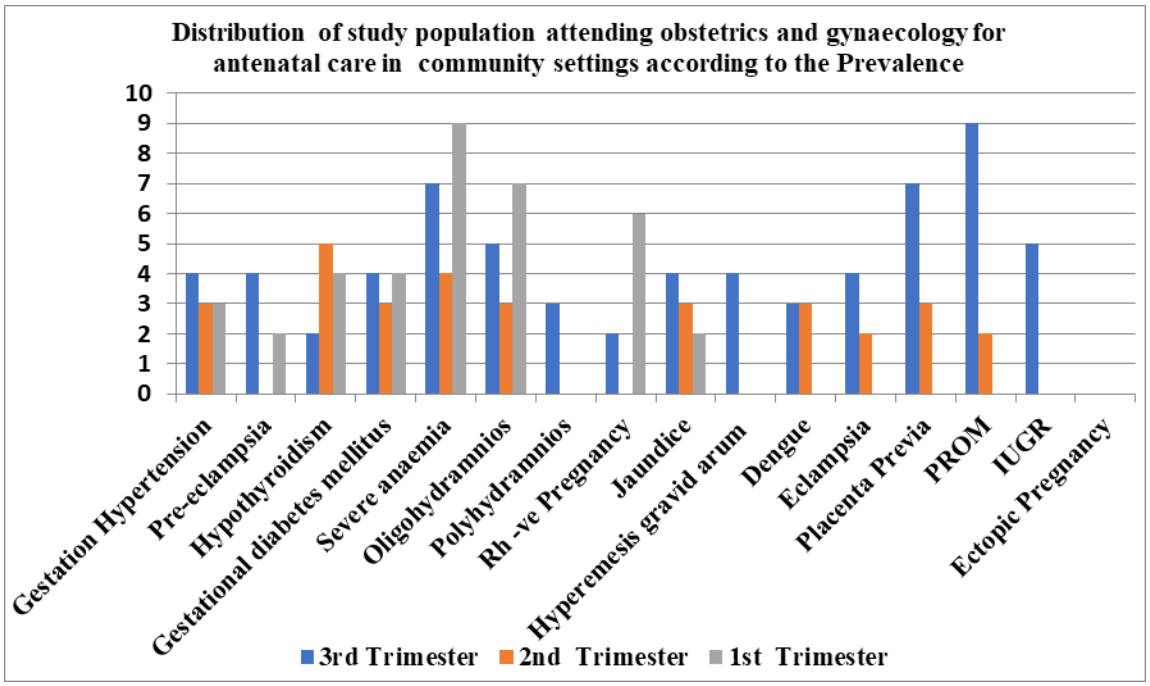

Figure 3. Distribution of study population attending obstetrics and gynaecology for antenatal care in community settings according to the Prevalence

Out of 150 women attending community settings for antenatal care service, 7 anaemia, and 7 pre-eclampsia women were reported in third trimester and majority of the women reported oligohydramnios (7) in first trimester.

Table 5. Distribution of study population attending obstetrics and gynaecology department in Hospital (Group A) and Community settings (Group B) according to the utilization of antenatal care services.

Antenatal care (ANC) Services		**HOSPITAL FREQUENCY (%)**	**COMMUNITY FREQUENCY (%)**
Pregnancy Registered	First trimester	33(22%)	28(19%)
	Second trimester	52(35%)	55(37%)
	Third trimester	65(43%)	67(44%)
Weight monitored during pregnancy	Yes	137(91%)	119(79%)
	No	13(9%)	31(21%)
Counselling During visits	First trimester	30(20%)	22(15%)
	Second trimester	45(30%)	40(27%)

	Third trimester	55(37%)	46(31%)
Calcium Received	Yes	138(92%)	106(71%)
	No	12(8%)	44(29%)
Doses of IPT-SP	Yes	58(39%)	38(25%)
	No	92(61%)	112(75%)
Deworming taken (During second or third trimester)	Yes	98(65%)	36(24%)
	No	52(34%)	114(76%)

Table 6. Distribution of study population attending obstetrics and gynaecology department in Hospital (Group A) and Community settings (Group B) according to the utilization of antenatal care services.

Content	**Received**		**Not received**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Told about pregnancy complications	168	56%	132	44%
Weight measured	213	71%	87	29%
Abdomen examined	142	47%	158	53%
Blood sample taken	121	41%	179	59%
Urine sample taken	115	38%	185	62%
Blood pressure measured	264	88%	36	12%
Diet recommended	67	22%	233	78%

Table 7. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to the Timing of initiation of ANC service visits.

Category	**Hospital (Group A) Percentage**	**Community (Group B) Percentage**
Visited ANC service after 12 weeks of gestation	23%	69%
Visited ANC service before or at 12 weeks of gestation	77%	31%

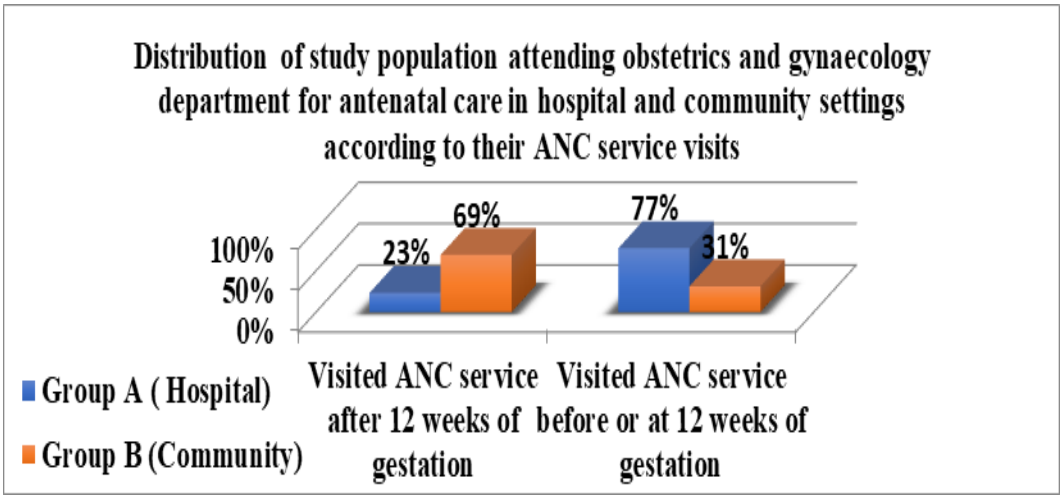

Figure 4. Distribution of study population attending obstetrics and gynaecology department for antenatal care in hospital and community settings according to their ANC service visit.

Of the 300-study population attending obstetrics and gynaecology department in both hospital and community settings, 77% of the women were initiated their antenatal care visits before or at 12th week of gestation in hospital settings on the other hand 69% of the women initiated their antenatal care visits after 12 weeks of gestation in community settings.

Table 8. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to the Utilization (%) of full antenatal care and different components.

ANC services	Group A (Hospital) Percentage	Group B (Community) Percentage
Consumption of IFA for at least 100 days	48%	30%
Minimum 4 ANC visits	56%	38%
At least 1 tetanus toxoid	96%	91%
Full ANC	23%	22%

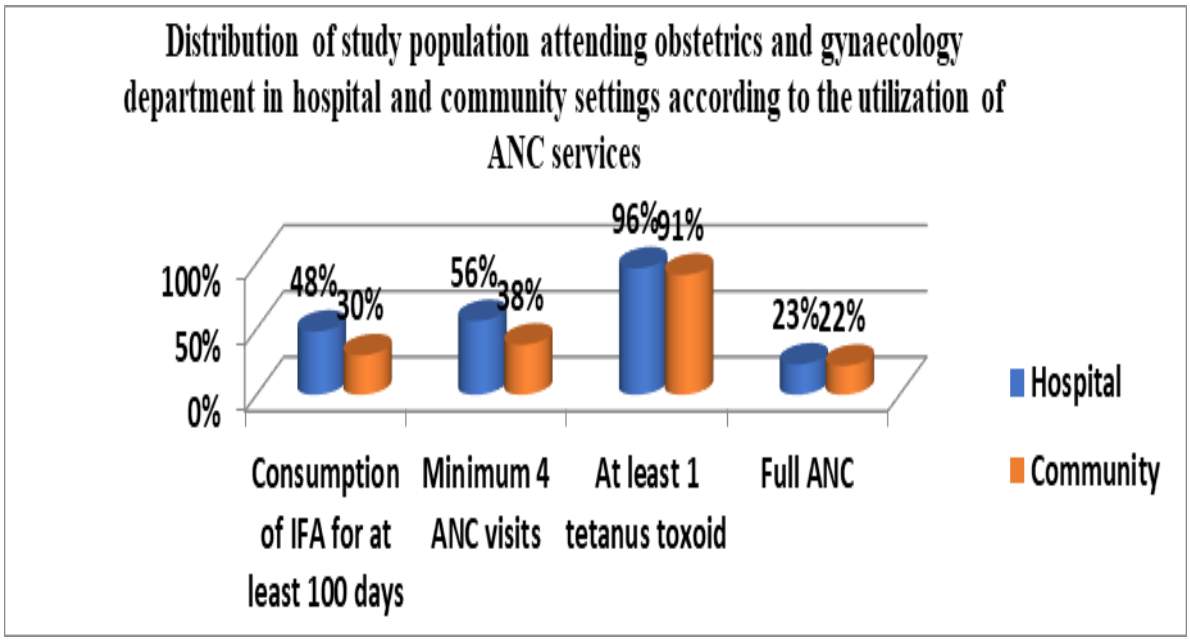

Figure 5. Distribution of study population attending obstetrics and gynaecology department in hospital and community settings according to the utilization of ANC services**.**

This study reveals that out of 300 population attending both hospital and community settings for utilizing antenatal care services, 23% of the women were taken full antenatal care in hospital settings and 22% of the women were reported for taking full antenatal care visits in community settings.

Table 9. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to the No of expected antenatal care visit for each gestation age.

ANC visits	Group A (Hospital) Percentage	Group B (Community) Percentage
1-3 visits	9%	23%
4-6 visits	26%	47%
7-9 visits	43%	26%
Above 10 visits	22%	4%

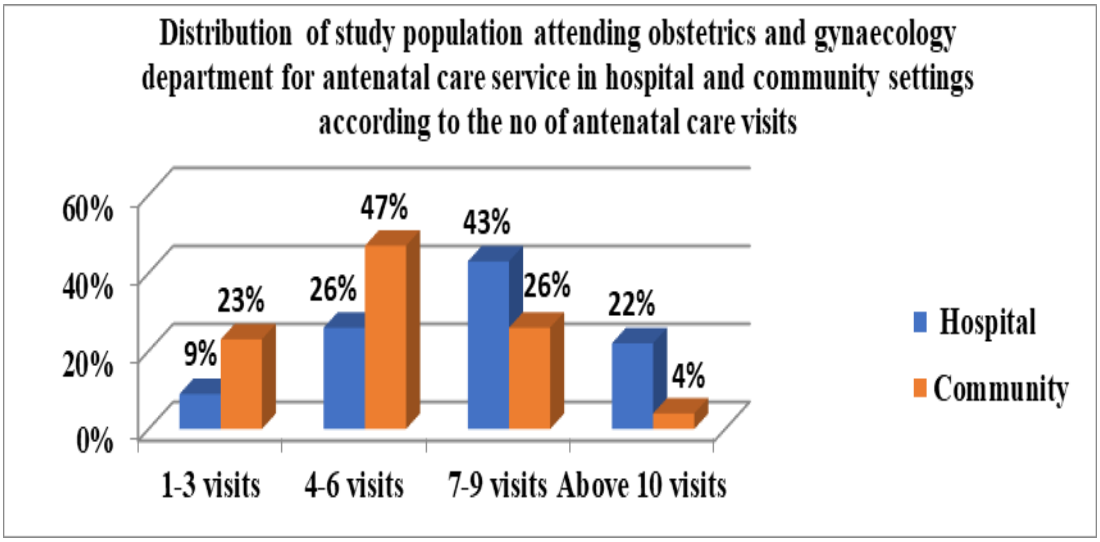

Figure 6. Distribution of study population attending obstetrics and gynaecology department for antenatal care service in hospital and community settings according to the no. of antenatal care visits.

Out of 300 study population, majority of the women were received 7-9 ANC visits in hospital with the distribution range of 43%, and 47% of the women received 4-6 ANC visits in community settings.

Table 10. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to the No of drugs prescribed per prescription.

No of drugs	Group A (Hospital)		Group B (Community)	
	Frequency	Percentage	Frequency	Percentage
>5 drugs	81	54%	67	45%
4 drugs	26	17%	32	22%
3 drugs	15	10%	29	19%
2 drugs	18	12%	14	9%
1 drug	10	7%	8	5%

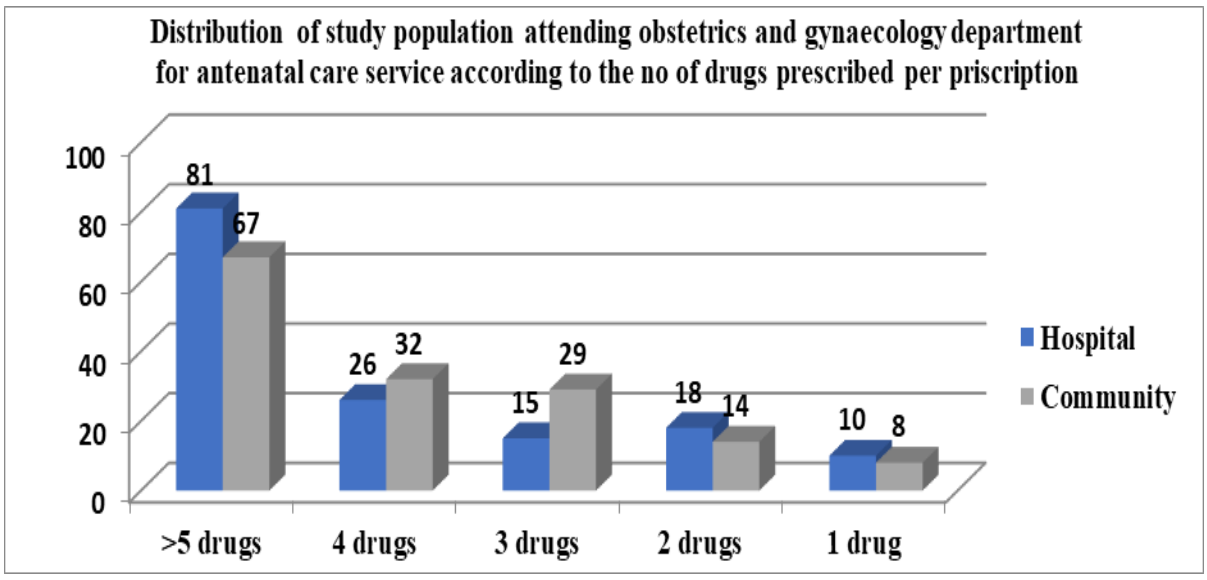

Figure 7. Distribution of study population attending obstetrics and gynaecology department for antenatal care service according to the no of drugs prescribed per prescription**.**

Of the 300 study population attending obstetrics and gynaecology department for antenatal care services, out of which majority of the women were prescribed more than 5 drugs in both hospital and community settings with the frequency of 81 (54%) and 67 (45%) respectively, and least number of women were prescribed 1 drug with the distribution range of 7% in hospital and 5% in community settings.

Table 11. Distribution of study population attending obstetrics and gynaecology department for antenatal care services in Hospital (Group A) and Community settings (Group B) according to the Classification of drugs.

Category	Group A (Hospital)		Group B (Community)	
	Frequency	Percentage	Frequency	Percentage
Antidiabetic	15	10%	11	7%
Antihypertensive	22	15%	11	7%
Anticonvulsants	10	7%	8	5%
Haematopoietic agents	25	16%	29	20%
Antiemetic	10	7%	6	4%
Antithyroid agents	18	12%	11	7%
Antibiotics	21	14%	33	22%
Analgesics	8	5%	9	6%
Antacids	6	4%	9	6%
Supplements	15	10%	23	16%

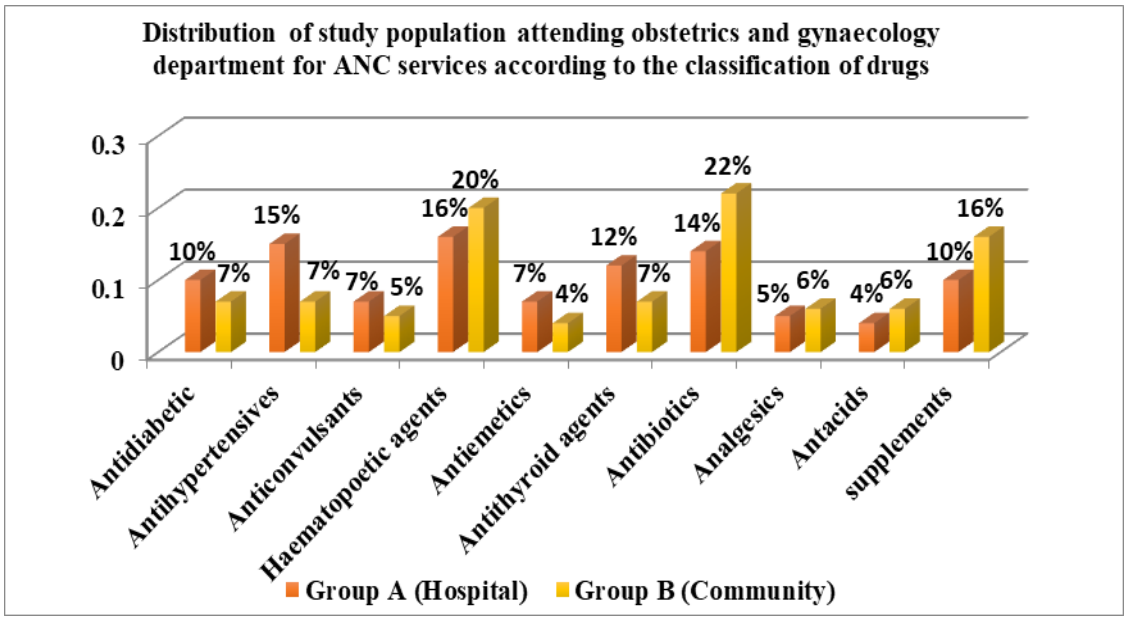

Figure 8. Distribution of study population attending obstetrics and gynaecology department for ANC services according to the classification of drugs.

Of the 300-study population attending obstetrics and gynaecology department for antenatal care service utilization, majority of the women were using haematopoietic agents in both hospital and community settings, 22 antihypertensive agents (15%), 21 antibiotics (14%), 15 antidiabetic agents (10%) in hospital, whereas in community 33 antibiotics (22%) and 23 supplements (16%).

Table 12. Distribution of study population attending obstetrics and gynaecology for antenatal care service utilization in hospital and community settings according to their clinical outcome measures.

Department	Complication	Frequency		Outcome Measurer	After Treatment Frequency(Percentage)	
		Hospital	Community		Hospital	Community
Cardiology	Gestational Hypertension	10	10	BP Control	8(80%)	6(60%)
		5	3	oedema (swelling)	2(40%)	1(33%)
	Pre-eclampsia	10	6	BP Control	7(70%)	4(67%)
		4	2	Proteinuria	3(75%)	1(50%)
Endocrinology	Gestational Diabetes Miletus	13	11	Hyperglycaemia	12(92%)	8(73%)
		11	9	Polyuria	7(63%)	5(55%)
	Hypothyroidism	13	11	Elevated thyroxine levels	10(77%)	7(64%)
		11	8	Weight gain	7(63%)	4(50%)
Neurology	Eclampsia	5	6	Proteinuria	3(60%)	3(50%)
		5	6	BP Control	4(80%)	4(67%)
Immune system	Dengue	5	6	Thrombocytopenia	3(60%)	2(33%)
		5	6	Vomiting's	5(100%)	5(83%)
Haematology	Severe Anaemia	10	15	pallor	8(80%)	9(60%)
		12	13	SOB	10(83%)	8(61%)
		14	17	malaise	11(78%)	12(70%)
	Oligohydramnios	10	15	<5cm AFI	8(80%)	8(53%)
		5	8	Abnormal FHR	3(60%)	5(62%)
	Polyhydramnios	4	3	>7cm AFI	4(100%)	2(67%)
	Rh-ve pregnancy	2	8	Large Abdomen	2(100%)	3(37%)
	Placenta Previa	7	10	Vaginal bleeding	5(71%)	6(60%)
Gynaecology	PROM	7	11	Abruption placentae	4(57%)	6(55%)
		3	6	Maternal Leucocytosis	2(67%)	2(33%)
	IUGR	7	5	Fundal height	5(71%)	1(20%)
	Ectopic pregnancy	4	0	β- Hcg concentration	2(50%)	0
Gastro-Intestinal	Jaundice	4	9	Hyperbilirubinemia	2(50%)	5(55%)
		2	3	pruritus	1(50%)	1(33%)
	Hyperemesis Gravid arum	4	3	Ketonuria	3(75%)	2(67%)

CONCLUSION

In conclusion, our research study will conclude a big gap between antenatal care and health facility delivery utilization in community and hospital settings among antenatal care attendees. The evaluation of data from both community and hospital settings demonstrated a positive correlation of antenatal care with health facility delivery. Having antenatal care has a relative advantage to increase the health facility delivery. But, it was not a solution by itself as there was more than half failure of delivering in health facilities among women who had antenatal care in community and hospital settings. In other words, antenatal care is a necessary intervention but not a sufficient factor in predicting the probability of birth in health facility. Therefore, future research should give emphasis to identifying barriers to health facility delivery among pregnant women who received antenatal care.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

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AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

REFERENCES

Abosse, Z., Woldie, M., & Ololo, S. (2010). Factors influencing antenatal care service utilization in Hadiya Zone. *Ethiopian Journal of Health Sciences, 20*(2), 75–82. https://doi.org/10.4314/ejhs.v20i2.69432

Adewuyi, E. O., Adefemi, K., Khanal, V., Bamidele, O. D., Akuoko, C. P., & Zhao, Y. (2018). Prevalence and factors associated with under-utilization of antenatal care services in Nigeria: A comparative study of rural and urban residences based on the 2013 Nigeria Demographic and Health Survey. *PLOS ONE, 13*(5), e0197324. https://doi.org/10.1371/journal.pone.0197324

Ahinkorah, B. O., Seidu, A.-A., Agbaglo, E., Adu, C., Budu, E., Hagan, J. E., Jr., et al. (2021). Determinants of antenatal care and skilled birth attendance services utilization among childbearing women in Guinea: Evidence from the 2018 Guinea Demographic and Health Survey data. *BMC Pregnancy and Childbirth, 21*(2), 2. https://doi.org/10.1186/s12884-020-03489-4

American College of Obstetricians and Gynecologists. (2021). *Gestational diabetes mellitus: Screening and diagnosis* (Practice Bulletin No. 190). Washington, DC: Author.

Awasthi, M. S., Awasthi, K. R., Thapa, H. S., Saud, B., Pradhan, S., & Khatry, R. A. (2018). Utilization of antenatal care services in Dalit communities in Gorkha, Nepal: A cross-sectional study. *Journal of Pregnancy, 2018*, 3467308. https://doi.org/10.1155/2018/3467308

Ayanore, M. A., Pavlova, M., & Groot, W. (2015). Unmet reproductive health needs among women in some West African countries: A systematic review of outcome measures and determinants. *Reproductive Health, 12*, 62. https://doi.org/10.1186/s12978-015-0104-x

Aziz Ali, S., Aziz Ali, S., Feroz, A., Saleem, S., Fatmai, Z., & Kadir, M. M. (2020). Factors affecting the utilization of antenatal care among married women of reproductive age in rural Thatta, Pakistan: Findings from a community-based case-control study. *BMC Pregnancy and Childbirth, 20*, 355. https://doi.org/10.1186/s12884-020-03009-4

Belay, A., Astatkie, T., Abebaw, S., Gebreamanule, B., & Enbeyle, W. (2022). Prevalence and factors affecting the utilization of antenatal care in rural areas of Southwestern Ethiopia. *BMC Pregnancy and Childbirth, 22*(1), 1–8. https://doi.org/10.1186/s12884-021-04362-8

Centers for Disease Control and Prevention. (2022). *Urinary tract infections in pregnancy*. Atlanta, GA: U.S. Department of Health and Human Services.

Gedefaw, G., Alemnew, B., & Demis, A. (2020). Adverse foetal outcomes and its associated factors in Ethiopia: A systematic review and meta-analysis. *BMC Pediatrics, 20*(1), 1–8. https://doi.org/10.1186/s12887-020-02176-9

Gebrekirstos, L. G., Wube, T. B., Gebremedhin, M. H., & Lake, E. A. (2021). Magnitude and determinants of adequate antenatal care service utilization among mothers in Southern Ethiopia. *PLOS ONE, 16*(7), e0251477. https://doi.org/10.1371/journal.pone.0251477

Ghosh-Jerath, S., Devasenapathy, N., Singh, A., Shankar, A., & Zodpey, S. (2015). Antenatal care utilization, dietary practices and nutritional outcomes in pregnant and recently delivered women in urban slums of Delhi, India: An exploratory cross-sectional study. *Reproductive Health, 12*, 20. https://doi.org/10.1186/s12978-015-0008-9

Girotra, S., Malik, M., Roy, S., & Basu, S. (2023). Utilization and determinants of adequate quality antenatal care services in India: Evidence from the National Family Health Survey (NFHS-5) (2019–21). *BMC Pregnancy and Childbirth, 23*(1), 800. https://doi.org/10.1186/s12884-023-06117-z

National Institute for Health and Care Excellence. (2019). *Antenatal care for uncomplicated pregnancies* (NG201). London, UK: NICE.

Onyeajam, D. J., Xirasagar, S., Khan, M. M., Hardin, J. W., & Odutolu, O. (2018). Antenatal care satisfaction in a developing country: A cross-sectional study from Nigeria. *BMC Public Health, 18*(1), 368. https://doi.org/10.1186/s12889-018-5285-0

Registrar General of India. (2021). *Special bulletin on maternal mortality in India 2017–19*. New Delhi, India: Office of the Registrar General, Ministry of Home Affairs, Government of India.

Rwabilimbo, A. G., Ahmed, K. Y., Page, A., & Ogbo, F. A. (2020). Trends and factors associated with the utilisation of antenatal care services during the Millennium Development Goals era in Tanzania. *Tropical Medicine and Health, 48*(1), 38. https://doi.org/10.1186/s41182-020-00226-7

Tiruneh, G. T., Getu, Y. N., Abdukie, M. A., Eba, G. G., Keyes, E., & Bailey, P. E. (2019). Distribution of maternity waiting homes and their correlation with perinatal mortality and direct obstetric complication rates in Ethiopia. *BMC Pregnancy and Childbirth, 19*, 214. https://doi.org/10.1186/s12884-019-2356-x

Umar, A. S., & Bawa, S. B. (2015). Antenatal care services utilization in Yobe State, Nigeria: Examining predictors and barriers. *International Journal of Maternal and Child Health and AIDS, 4*(1), 35–46. https://doi.org/10.21106/ijma.54

United Nations. (2015). *Trends in maternal mortality: 1990–2015* (Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division). New York, NY: United Nations Population Division.

United Nations Children's Fund. (2023). *Antenatal care statistics*. New York, NY: UNICEF.

World Health Organization. (1994). *Coverage of maternal health services: Findings from household surveys*. Geneva, Switzerland: WHO Press.

World Health Organization. (2002). *Antenatal care randomized trial: Manual for the implementation of the new model*. Geneva, Switzerland: WHO.

World Health Organization. (2016). *WHO recommendations on antenatal care for a positive pregnancy experience*. Geneva, Switzerland: WHO.

World Health Organization. (2019). *Trends in maternal mortality: 2000–2017* (Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division). Geneva, Switzerland: WHO.

World Health Organization, World Bank Group, United Nations Children's Fund, & United Nations Population Fund. (2015). *Country-based estimates of maternal mortality: 1990–2015* (WHO/RHR/15.02). Geneva, Switzerland: WHO.

Yesuf, E. A., & Calderon-Margalit, R. (2013). Disparities in the use of antenatal care service in Ethiopia over a period of fifteen years. *BMC Pregnancy and Childbirth, 13*, 131. https://doi.org/10.1186/1471-2393-13-131