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Research article

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Prescription pattern and associated factors among pregnant women attending antenatal clinics in University of Gondar, North West Ethiopia



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ARTICLE INFO	A B S T R A C T				
<i>Keywords:</i> Prescription Teratogenicity risk Pregnant women FDA drug risk category	 Background: An inappropriate use of drug during pregnancy may harm the fetus. There is no enough study on drug use among pregnant women at the University of Gondar referral hospital. Most studies are carried out in developed countries but not in developing countries. Thus, the aim of this study was to evaluate prescription of drug and associated factors among pregnant women attending antenatal care service in University of Gondar referral hospital. Methods: Institution based cross sectional study was used among 334 pregnant women who attended antenatal care units of the University of Gondar referral hospital. Data were collected from the pregnant women medical records and registration logbook and analyzed using SPSS version 23. Multivariate logistic regression used to analyze the association of the independent variables with drug use. P-values <0.05 were considered significant. Result: A total of 334 pregnant women's medical records showed a total of 631 drugs prescribed. The average numbers of drugs per pregnant women was 1.88. All pregnant women (100%) were prescribed with iron folat. Most pregnant women 185 (55.2%) were in the third trimester followed by third trimester 91 (27.25%). Moreover, 23.77%, 42.95%, 33%, and 7% pregnant women encountered with drugs from category A, B, C and D respectively. From the bivariate regression analysis, Age of women, maternal illness, trimester at the first visit, and gravidity were significantly associated with exposure to prescribed drug use during pregnancy. Conclusion: The present study showed the deviation of drug use pattern from the WHO optimal levels proposing the hospitals had inappropriate use of drug. Implementing corrective measures are required to achieve the recommended standards of appropriate drug use. 				

1. Background

Pregnancy is a profound physiological condition where drug use presents a challenge to health professional in the selection of drugs for their patients due to pharmacokinetic and pharmacodynamic changes. Besides, some drugs cross the placenta and may affect the foetus [1].

Pregnant women use prescription-only drugs (with/without errors) and over-the-counter (OTC) drug for both pregnancy-related disorders and chronic disease that need continuous or interrupted management (e.g. epilepsy, asthma, and hypertension), potentially exposing the fetus to drugs that may have a negative effect during gestation [2]. Approximately 8 of 10 women use at least one drug during pregnancy. But, there is no sufficient data to characterize the fetal risks of several drugs commonly prescribed during pregnancy. Hence, drug utilization must be avoided in pregnancy unless necessary [3]. Prescription of drugs for a

pregnant woman would require knowledge of teratogenicity, fetal and neonatal effects. Regardless of the limited data on the safety of drugs in pregnancy, drug use in pregnant women is common [4].

To guide appropriate drug use during pregnancy, Food and Drug Administration (FDA) grouped drugs into five categories A, B, C, D, and X. this classification showed that the effect of the drug on the fetus based on animal and human data and recommends the degree of precaution that should be undertaken [5]. Globally, drug use during pregnancy has been an issue of concern since the discovery of birth defects resulting from thalidomide use in early pregnancy [6]. Birth defects have the prevalence of 5 percent of infants examined at birth but the prevalence of birth defects may be as high as 8 percent. Drugs are known to account for approximately 1% of the possible external Causative factor for teratogenic effect [5, 6]. The primary objective of a drug prescribing pattern study is to facilitate rational use of drugs. Rational use of a drug implies

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the prescription of the drug in an appropriate dose for the right indication, with accurate data and at a reasonable price. Without knowledge of how drugs are being prescribed and used, it is difficult to initiate a discussion on rational drug use and to suggest measures to change prescribing practices for the better [7].

In Ethiopia, few studies showed that the inappropriate prescription of drug during pregnancy. Studies were undertaken in Bahir Dar, Southern Tigray region, and Addis Ababa displayed that 87.5, 71.3 and 88.4% of the pregnant women used one drug. Among these of pregnant women about 0.5%, 4% and 11% of pregnant women used drugs from category D or X, respectively [8, 9, 10]. Most women in Ethiopia live in rural areas which have no access to health care center, so the inappropriate drug use may be worse [11]. From the previous studies, there was irrational use of drugs during pregnancy and most of the drugs were from category D and X. Therefore, it is important to assess drug use behavior and associated risk factors among these people in the Ethiopia and especially in our town. Data on prescribed drug use among pregnant women in University of Gondar referral hospital is lacking. Therefore, this study was done to assess the pattern of prescribed drugs and associated factors among pregnant women attending University of Gondar referral hospital and identify factors associated with prescribed drug use.

2. Methods

2.1. Study design, period and study setting

A retrospective institution-based cross-sectional study was done by reviewing the antenatal care follow-up charts from May 7, 2020, to May 7, 2021, among pregnant women who had been receiving services in ANC units of the University of Gondar referral hospital. University of Gondar referral hospital is located in Gondar town, which is far from about 750 km Northwest of Addis Ababa. University of Gondar referral hospital is a teaching hospital that serves more than five million people in the catchment area. The University of Gondar has 14 wards with 400 beds in five different inpatient departments.

2.2. Sample size and sampling procedure

The sample size (n) for this study was calculated by using a single population proportional formula that is $n = Z^2 pq/d^2$ assuming 50% prevalence because there was no similar study undertaken in the area. The sample size was 384 by considering a 5% of margin of error at 95% = 1.96 confidence interval.

Where p = the proportion of drug use among pregnant women = 0.5, q = [1 - p], $Z1-\alpha =$ confidence interval of 95% = 1.96, d = margin of error of 5% = 0.05. *n* is minimum sample size.

$$n = (Z^2 pq)/d^2 = (1.96^2 \times 0.5 \times 0.5)/(0.05)^2 = 384$$

A correction formula was used to adjust the sample size because eligible pregnant women who used the ANC service during the study period were 1452 which is less than 10,000 populations.

$$n_f = \frac{n_i}{1 + n_{i/n_t}}$$

$$n_{\rm f} = 384/(1+(384/1452)) = 304$$

Where n_i is the initial sample size (calculated sample size); n_f is the final sample size; n_t is the total no of eligible pregnant women in Gondar University referral hospital. Then by considering 10% allowance to compensate for the nonresponse rate the final sample size was found to be 334.

The total number of pregnant women who have follow-up their pregnancy at the University of Gondar referral hospital ANC unit for the last 12 months were taken from ANC follow log book and then the average number of pregnant women per day was calculated to determine the sampling interval. The first medical record was taken by the lottery method from the patients' medical registration logbook then the remaining participants were selected by systematic random sampling technique. All study subjects consented to participate in the study just before or during the first prenatal care visit.

2.3. Source population

All medical records of pregnant women who attended ANC units of the University of Gondar referral hospital from May 7, 2020, to May 7, 2021, were taken as a study population.

2.4. Target population

The study populations of the study were the medical records of pregnant women who attend the ANC unit during the one-year duration with complete card records at the ANC service unit. During the one-year duration, 1452 pregnant women follow up ANC ward.

2.5. Inclusion and exclusion criteria

All pregnant women who were fully attending ANC units of the University of Gondar referral hospital with complete medical records were included in the study. When pregnant women had incomplete data they were excluded from the study.

2.6. Dependent variable

• The number of drugs which had been prescribed.

2.7. In dependent variable

• The total number of ANC visits, gestational age.

2.8. Data collection processing and analysis

The pregnant women's registration logbook and medical charts were reviewed, and important medical data were recorded in a data collection format designed for the study. The data extraction forms were used to collect socio-demographic data (age, marital status religion, occupation, educational status, and residency), medical histories (pregnancy status, gravida, and history of illness, total number of ANC visits, gestational age), and drugs, which had been prescribed previously during each trimester. Experienced nurses who had been working in the University of Gondar referral hospital ANC unit gathered the data. To ensure data quality, the investigator checked the data daily for completeness, clarity, accuracy, and consistency at each step during the data collection process. Any error, ambiguity, or incompleteness discovered was immediately remedied.

Drugs prescribed to pregnant mothers were grouped based on the pharmacological and the US-FDA risk classification systems. After data collection, Quantitative data were entered using EPIINFO version 3.1.5 and analyzed by SPSS version 23. Descriptive statistics like frequency, percentages, and mean \pm standard deviation, were calculated and presented in the form of tables.

The odds ratio was used to assess the association between dependent and independent variables. With a 95 % confidence interval, a p-value of 0.05 was considered significant to examine the degree of significance.

2.9. Ethical clearance

Ethical approval and clearance were obtained from the ethical review committees of the College of Health Sciences and medical science the behalf of the University of Gondar. Participants were informed about voluntarism and that they can withdraw at any time of the study if they want not to respond. For those who were volunteer verbal consents were obtained before the studies begin.

3. Results

3.1. Socio-demographic and pregnancy related information

A total of 334 patients ANC chart of pregnant women were assessed and reviewed who have ANC follow up at the University of Gondar referral hospital ANC unit during the study period.

Most of these pregnant women 98.3% were married and 76.5% were between the age of 20 and 30. The mean (\pm SD) age of pregnant women was 25.3 (\pm 5.0) years. Three hundred twenty-four (97 %) pregnant women were married and 6 (1.75%) were divorced. Most pregnant women 185 (55.25%) were in their third trimester. From a total pregnant women included in the study were Second gravidae 178 (53.25%), multigravidae 91 (27.25), and Primigravida 65(19.5%). 130 (38.8%) of the pregnant women chart showed a history of chronic disease as shown in Table 1.

3.2. Drugs prescribed during pregnancy

From a total of 631 drugs prescribed for the pregnant women excluding Iron supplementation (100%), Antihelmentics (22.1%), antibacterial agent (17.7%), and analgesics (15.4%). The class of drugs like antihistamines, antitussives, and β adrenergic agonist were the least prescribed drugs as presented in Table 2. All women supplemented with iron preparation. From each class of drug prescribed among non-routine medications: Acetaminophen was the most commonly prescribed drug, which accounts for 82 (12.99%) followed by Mebendazole, Amoxicillin, MTS, and Metronidazole each accounted for 107 (16.95%), 60 (9.51%), 19 (3.01%), and 17 (2.69%) respectively.

3.3. Pregnancy category of prescribed drugs

From the total of 631 drugs prescribed for the pregnant women, category B drugs comprised the highest category 271 (42.95%) followed

Table 1	L. Socio-d	lemographic	and	obstetric	characteristics	of	pregnant	women
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Variable	Category	No of women	Percent (%)
Age	<20	47	14
	20–30	255	76.5
	>30	32	9.5
Marital status	Married	324	97
	Divorced	6	1.75
	single	4	1.25
cation of health facility ccupation	Urban	245	73.25
	Rural	89	26.75
Occupation	Housewife	233	69.75
	Working	101	30.25
Monthly income (in birr)	<1000.00	65	19.5
	1000.00-2000.00	178	53.25
	>2000.00	91	27.07
Gravidity	Primigravidae	65	19.5
	Secondigravidae	178	53.25
	Multigravida	91	27.25
Comorbid (disease other	Yes	130	38.8
than pregnancy) condition	No	204	61.3
First visit to the health center	1st trimester	42	11.3
	2nd trimester	74	22.13
	3rd trimester	185	55.2
	Unknown	33	10.15

Table 2. Distribution of the drugs prescribed for pregnant women attending ANC unit.

Class of drugs	Specific prescribed drugs
Antibiotics (Antibacterial)	Amoxicillin 60 (9.51%), Trimetoprim-sulfametoxazole 11 (1.74%), Cloxacillin 10 (1.58%), Azithromycin 7 (1.11%), Cephalexin 6 (0.95%), Ciprofloxacin 6 (0.95%), Ceftriaxone 5 (0.79%), Erythromycin 3 (0.48%), Norfloxacin 1 (0.16%), and Mofloxacin 1 (0.16%)
Antacids/PPIs/H2 blockers	MTS 19 (3.01%), Omeprazole 6 (0.95%)
Fluids	NS 4 (0.63%), ORS 13 (2.06%), D 40% 4 (0.63%) 21
Analgesics	Paracetamol 82 (12.99%), Diclofenac 7 (1.11%), Tramadol 5 (0.79%), Ibuprofen 5 (0.79%)
Anti-emetics	Metoclopramide 10 (1.58%), Chlorpromazine 1 (0.16%) 11
Anthelmintics	Mebendazole 107 (16.95%), Albendazole 32 (0.32%)
Vitamins/Minerals	Folic acid 30 (4.74), Multivitamin 10 (1.58%), Vitamin B complex 10 (1.58%), vitamin B1 8 (1.3%), Vitamin C 7 (1.1%)
Antiprotozoal	Metronidazole 17 (2.69%)
Antihistamines	Diphenhydramine 4 (0.63%)
Antitussives	Dextromethorphan 2 (0.32%)
Beta Adrenergic Agonists	Albuterol 2 (0.32%)

by category C, and category A, which in turn accounted for 210 (33.3%) and 150 (23.77%) respectively as shown in Table 3.

3.4. WHO prescribing indicators

A total of 631 drugs excluding iron were prescribed for 334 pregnant women who visited the ANC unit which gave rise to an average of 1.88 drugs per individual. From which 58.2% of drugs were ordered during the 3rd trimester followed by 21.9%, 11.6%, and 8.4% were prescribed during the 2nd, 1st trimesters, and unknown trimester respectively as shown in Table 4. The average number of medications per prescription found to be 1.88, while the percentage of encounters with antibacterial agent and injections prescribed was 27.3% and 5%, respectively. All drugs (100%) were prescribed by using their generic names as presented in Table 4.

3.5. Prescription drug use during pregnancy and associated factors

From the bivariate regression analysis, Age of women in years, Current maternal illness, trimester at the first visit, and gravidity were significantly associated with exposure to prescribed drug use during pregnancy. These independent variables were further analyzed with a multivariate logistic regression model as shown in Table 4.

Accordingly, multigravida pregnant women were more likely to be prescribed with the drugs as compared to primigravida [AOR = 7.356, 95% Cl (2.455–22.04)]. But, Secondigravidae pregnant women were more likely exposed to more prescribed drugs as compared to primigravida [AOR = 5.375, 95% Cl (1.961–14.738)]. Similarly, those pregnant women with a 3–4 times visit had less chance of being exposed to prescribed drugs in comparison to those women who had 1–2 times visits [AOR = 0.104, 95% Cl (0.042–0.258)]. Pregnant women who visited the ANC during the second [AOR = 7.945, 95% Cl (1.768–35.702)] trimesters had more chance of being exposed to prescribed drugs in comparison to those women who visited the ANC during their first trimester. But Pregnant women who visited the ANC during their first trimesters were less likely exposed to prescribed drugs as compared to the first trimesters [AOR = 0.054, 95% Cl (0.012–0.243)].

Pregnant women with comorbidities [AOR = 5.51, 95% Cl (1.73-17.59)] were found to be 5 times more likely to have prescribed drugs in comparison to those women who have no current illness. However, pregnant women with the age range 20–30 were found to be

Table 3. FDA pregnancy category of prescribed drugs for pregnant women.

FDA Pregnancy Category	Frequency (%)						
	1st	2nd	3rd	Unknown			
A: Adequate clinical studies have shown no risk to fetus in any trimester: Multivitamin (13), Vitamin B complex (10), Folic acid (30), thiamine (vitamin B1) (8), Vitamin C (7), and other drugs	34	52	49	15	150 (23.77)		
B: Animal studies have not shown adverse effect on the fetus and there are inadequate clinical studies: Amoxycillin (60), Azithromycin (7), Paracetamol (82), Metoclopramide (10),Erythromycin (3), Cloxacillin (10), Diclofenac (7), Ceftriaxone (5), Diphenhydramine (4), Cephalexin (6) and other drugs	28	48	173 (27.4)	22	271 (42.95)		
C: Animal studies have shown adverse effects, no adequate clinical studies. May be useful in pregnancy despite potential risks: Mebendazole (107), Albendazole (32), Tramadol (5), Metronidazole (17), Ibuprofen (5), Salbutamo (2), Magnesium hydroxide/Aluminum hydroxide (17), Cotrimoxazole (13), Ciprofloxacin (6), Omeprazole (6) and other drugs	11	38	145 (23%)	16	210 (33.3)		
D: There is evidence of risk to human fetus, but potential benefits may be acceptable despite potential risks none	0	0	0	0	0		
X: Animal/human studies show foetal abnormalities. Risks involved clearly outweigh benefits: (None)	0	0	0	0	0 (0)		
Total%	73 (11.6)	138 (21.9)	367 (58.2	53 (8.4)	631		

less likely to have a prescribed drug as compared to those women with the age of 15–20 [AOR = 0.6, 95% Cl (0.021-0.174)]. But pregnant women with the age range 30–42 were found to be more likely to have prescribed drug as compared to those women with the age of 15–20 [AOR = 5.576, 95% Cl (2.204-14.125)] as shown in Table 5.

4. Discussion

The therapeutic use of drugs during early pregnancy is a concern since it may cause birth defects like thalidomide use in pregnant women in the early 1960s for the management of nausea in pregnant women. Most pharmaceutical products used for pregnant women may affect the fetus. Hence, prescribing drug for pregnant women need knowledge of teratogenicity that associate with the drug under consideration. Therefore, to increase the knowledge about any potential teratogenic effects of a drug and the doses at which such effects will develop, it is important to gather information about all medicinal products taken by pregnant women [12, 13]. The present study assessed prescription pattern and associated factors among pregnant women attending antenatal clinics in. In this study, a total of 631 drugs were prescribed for 334 pregnant women who visited the ANC unit which gave rise to an average of 1.8 drugs per individual, within the range of the standard set by WHO (1.6–1.8). This finding is in line with the study conducted in Nekemt Referal Hospital, which showed incomparable results compared to the present study in which a total of

183 drugs with an average of 0.8 drugs per individual pregnant woman [14]. A similar study conducted a total of 430 drugs that were prescribed for 234 pregnant women who visited the ANC unit of Kemisse General Hospital which gave an average of 1.83 drugs per individual pregnant women [15]. From 334 pregnant women who were prescribed with at least one medication during their visit, 55.39% were prescribed during the third trimester followed by 18.84%, 17.21%, and 10.55 drug prescriptions during the second, unknown trimesters and first trimester, respectively. While a study conducted in Kemisse General Hospital showed that 166 (63.2%) of drugs were prescribed during the third trimester [15]. This discrepancy might be due to variations in numbers of pregnant women throughout the trimester in studies, the study facility levels, and the professional levels. The advantages of rational drug use during pregnancy are not only restricted to the recovery of maternal health, but are also helpful in the development of the fetus. By appropriate treatment of conditions like diabetes mellitus and infectious diseases of genital organs, embryopathies, preterm births and abortions could be prevented [16].

In the present study the most widely issued class of drugs other than (minerals and vitamins) were anthelminthics, which accounts 22.1%, followed by antibiotics, analgesics, and antacids each accounted for 17.7%, 15.4% and 3.96 % respectively. This result is less comparable with research done in Jimma University Specialized Hospital, in which the most commonly prescribed medications were antibiotics [17].

Table 4. Prescription pattern analysis using WHO prescribing indicators for pregnant women attending ANC Unit.

Prescribing Indicators	1st TM	2nd TM	3rd TM	Unknown TM	Total	Reference
Average number of drugs per prescription	1.73 (73/42)	1.86 (138/74)	1.95 (367/185)	1.64 (56/34)	1.8 (631/334)	1.6–1.8
Percentage of encounters with antibiotics	28.5% (12/42)	33.8% (25/74)	32% (59/185)	27.3% (9/33)	33.8 % (113/334)	20-26.8%
Percentage of encounters with an injection	-	6.7% (5/74)	5.9% (11/185)	9.01% (3/33)	5.75% 19/334	13.4–24.1%
Percentage of drugs prescribed by generic name	100%	100%	100%	100%	100%	100%
	42/42	74/74	185/185	33/33	334/334	

Table 5.	Factors	associated	with pr	rescribed	drug use	during	pregnancy	among
pregnant	women	attending A	ANC serv	vice in Al	NC units o	of the un	iversity of	Gondai
referral H	Iospital.							

Variable	Drugs	prescrit	oed	AOR (95% CI)	P-Value	
	Yes		No			
Age of women in years						
15–19	4		78		0.001	
20–34	157		38	0.06 (0.21–0.17)	0.001	
35-43	44		13	5.579 (2.20–14.13)	0.001	
Gravidity						
Primigravida	39		26		0.001	
Secondigravidae	113		65	7.36 (2.46–22.04)	0.001	
Multigravida	55		36	5.38 (1.96–14.74)	0.001	
Number of ANC visits						
1–2 times	152		94		0.001	
3–4 times	53		35	0.104 (0.042–0.258)		
First visit to the Health facility						
First trimester	33		9		0.001	
Second trimester	64		13	7.945 (1.76–35.70)	0.001	
Third trimester	93		92	0.54 (0.12–0.243)	0.001	
Unknown	17		17	0.103 (0.021–0.511)	0.001	
Current maternal illness						
No	37	66				
yes	170	48		5.5 (1.73–17.59	0.004	
Education status						
Attained formal education	94	47				
No formal education	113	69			0.01	

Another study done by Molla F *et al.* showed that the most prevalent issued drugs have been antibiotics (41%) [18]. The high frequency of antibiotic in these studies shows us that those patients were mostly encounter with an infectious disease. In this study, utilization of antibiotics was high which increase antimicrobial resistance that is one of the world most pressing public health problems. This study also found Antacids/PPIs, analgesics, antihelmetics, antiemetics, and vitamins were the commonly prescribed drugs throughout the study. According to results of this study the use of routine medication especially during the first and second trimester of pregnancy, Iron sulphate and mebendazole on the third trimenster commonly were used.

The US-FDA pregnancy Categories system was used to assess the risk of issued drugs for pregnant women. In this study most drugs issued for a pregnant women were from category B comprising 42.95 % of the prescribed drugs followed by category C, and A, each accounted for 33.3%, 23.77%, respectively. In this study category X drug were not utilized. Comparing this result with a study also done in Jimma University Specialized Hospital reported that category- C drugs 56.3 % followed by category-B 165 (48.7%) [19]. Higher proportion of medications use observed in the third 58.2 % and second 21.9% trimesters compared to first 11.6% trimester of pregnancy. Compared to the result found in Jimma University Specialized Hospital 57.2 % drugs prescribed during third trimester [19].

In this study category X drug were not utilized. Such findings are in line with the findings of Oshikoya et al. where category X medicines which are contraindicated in pregnancy were not prescribed. Even though, category X drugs were not prescribed throughout the study. But, still there are chances of teratogenicity in their fetus. Hence, minimal usage of drugs belonging to Category C and Category D respectively should be done [20]. Percentage of drugs prescribed by generic name in the present study was (100%) similar with WHO reference value of 100%. This finding is in line with the findings of Chaudhari et al. where 90 % of the drugs were prescribed by generic name [21].

In the present study Percentage of encounters with antibiotics prescribed in this study (33.8%) was much higher than standard set by WHO (20-26.8%) which showed over use of antibiotics. A similar study conducted in India found that percentage of encounters with antibiotics was 31.8 % which is in lined with the present study [22]. Another study done in Adama Referal Hospital also found that the percentage of encounters with antibiotics prescribed was within the range of the standard set by WHO 24.0% [23]. Percentage of encounters with injectables (5%) which is within the range of the standard set by WHO (13.4-24. 1%). In this finding the therapeutic use of antibiotics slightly high and the use of injection is less based on the standard due to availability drug and professional difference compared to other studies. Antimicrobial resistance is an increasing problem worldwide, impacting infection control efforts and costs of antimicrobial treatment [22, 23]. Numerous factors contribute to the problem, including unnecessary antimicrobial prescribing by trained and untrained health workers, uncontrolled dispensing by drug vendors, poor antibiotic prophylaxis in surgery, and poor infection control practices.

4.1. The strength and limitation of the study

A major strength of our study is using data from the patient chart. Patient chart gives better data than an interview that is characterized by recall bias and under-ascertainment. By systematically auditing the charts of the pregnant women, we performed a holistic evaluation of drugs used at the University of Gondar referral hospital. Besides, this study has presented adequate data on prescription analysis on pregnant women, which is important to develop guidelines on rational drug use during pregnancy. This study is limited to a single institution. We recommend further study at the multi-site with larger sample size.

5. Conclusions

From 334 pregnant women who were prescribed medication during their visit, 48.7% were prescribed during the third trimester. From the present study it can be concluded that a third of (76.5) the studied population was encountered with drugs from category C and B, which are thought to cause possible fetal harm. The prescribing trend among prescribers for pregnancy is irrational. Antibiotic was the highest group prescribed followed by antacid, IV fluids, analgesic and anthelmintic. Percentage of encounters with antibiotics prescribed was higher than the WHO standard which indicates overuse of antibiotics. Moreover, percentage encounter with injection was higher in first trimesters which also indicate costly form of drug therapy. Average number of drugs prescribed which was within the range of WHO standard.

Declarations

Author contribution statement

Tafere belete; Esubalew Mengesha; Assefa Kebad; Amanuel Dandena; Gashaw Sisay; Wudneh Simegn; Abebe Basazin: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data included in article/supp. material/referenced in article.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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References

- [1] P. Sachdeva, B.G. Patel, B.K. Patel, Drug use in pregnancy; a point to ponder, Indian J. Pharmaceut. Sci. 71 (1) (2009) 1.
- [2] K.J. Marwa, A. Njalika, D. Ruganuza, D. Katabalo, E. Kamugisha, Self-medication among pregnant women attending antenatal clinic at Makongoro health centre in Mwanza, Tanzania: a challenge to health systems, BMC Pregn. Childbirth 18 (1) (2018) 16.
- [3] A. Tuha, Y. Gurbie, H.G. Hailu, Evaluation of knowledge and practice of pharmacy professionals regarding the risk of medication use during pregnancy in dessie town, northeast Ethiopia: a cross-sectional study, J. Pregn. 2019 (2019).
- [4] J. Servey, J.G. Chang, Over-the-counter medications in pregnancy, Am. Fam. Physician 90 (8) (2014) 548–555.
- [5] J.N. Trønnes, A. Lupattelli, H. Nordeng, Safety profile of medication used during pregnancy: results of a multinational European study, Pharmacoepidemiol. Drug Saf. 26 (7) (2017) 802–811.
- [6] N. Vargesson, Thalidomide-induced teratogenesis: history and mechanisms, Birth Defects Res. Part C Embryo Today – Rev. 105 (2) (2015) 140–156.
- [7] A. Aslam, S. Khatoon, M. Mehdi, S. Mumtaz, B. Murtaza, Evaluation of rational drug use at teaching hospitals in Punjab, Pakistan, J. Pharm. Pract. Commun. Med. 2 (2) (2016) 54–57.

- [8] F. Molla, A. Assen, S. Abrha, B. Masresha, A. Gashaw, A. Wondimu, Y. Belete, W. Melkam, Prescription drug use during pregnancy in Southern Tigray region, North Ethiopia, BMC Pregn. Childbirth 17 (1) (2017) 170.
- [9] B. Kebede, T. Gedif, A. Getachew, Assessment of drug use among pregnant women in Addis Ababa, Ethiopia, Pharmacoepidemiol. Drug Saf. 18 (6) (2009) 462–468.
- [10] C. Admasie, B. Wasie, G. Abeje, Determinants of prescribed drug use among pregnant women in Bahir Dar city administration, Northwest Ethiopia: a cross sectional study, BMC Pregn. Childbirth 14 (1) (2014) 325.
- [11] Y.B. Okwaraji, E.L. Webb, K.M. Edmond, Barriers in physical access to maternal health services in rural Ethiopia, BMC Health Serv. Res. 15 (1) (2015) 493.
- [12] R. Ofori-Asenso, P. Brhlikova, A.M. Pollock, Prescribing indicators at primary health care centers within the WHO African region: a systematic analysis (1995–2015), BMC Publ. Health 16 (1) (2016 Dec 1) 724.
- [13] K. Oshikoya, I. Akionla, I. Senbanjo, I. Oreagba, O. Ogunleye, Medicines used in pregnancy, childbirth and lactation in a teaching hospital in Lagos, Nigeria, Sri Lanka J. Obstetr. Gynaecol. 34 (3) (2012).
- [14] F. Asfaw, M. Bekele, S. Temam, M. Kelel, Drug utilization pattern during pregnancy in Nekemte referral hospital: a cross sectional study, Int. J. Sci. Rep. 2 (8) (2016) 201–206.
- [15] B.K. Alemu, N.N. Wolle, Prescription drug use and potential teratogenicity risk among pregnant women attending maternal and child health clinic of Kemisse General Hospital, Northeast, Ethiopia, BMC Res. Notes 12 (1) (2019) 592.
- [16] K.A. Latuskie, N.C. Andrews, M. Motz, T. Leibson, Z. Austin, S. Ito, D.J. Pepler, Reasons for substance use continuation and discontinuation during pregnancy: a qualitative study, Women Birth 32 (1) (2019) e57–64.
- [17] N. Bedewi, M. Sisay, D. Edessa, Drug utilization pattern among pregnant women attending maternal and child health clinic of tertiary hospital in eastern Ethiopia: consideration of toxicological perspectives, BMC Res. Notes 11 (1) (2018) 1–7.
- [18] F. Molla, A. Assen, S. Abrha, B. Masresha, A. Gashaw, A. Wondimu, Y. Belete, W. Melkam, Prescription drug use during pregnancy in Southern Tigray region, North Ethiopia, BMC Pregn. Childbirth 17 (1) (2017) 170.
- [19] M.A. Mohammed, J.H. Ahmed, A.W. Bushra, H.S. Aljadhey, Medications use among pregnant women in Ethiopia: a cross sectional study, J. Appl. Pharmaceut. Sci. 3 (4) (2013) 116.
- [20] K.A. Oshikoya, O.F. Njokanma, H.A. Chukwura, I.O. Ojo, Adverse drug reactions in Nigerian children, Paediatr. Perinat. Drug Ther. 8 (2) (2007) 81.
- [21] A. Chaudhari, D. Aasani, H. Trivedi, Drug utilization study in antenatal clinic of obstetrics gynaecology department of a tertiary care hospital attached with medical College, Indian J. Pharm. Pharmacol. 3 (4) (2016) 186–191.
- [22] M. Fikadu, D. Kebebe, W. Amelo, F. Gashe, Drug utilization pattern and potential teratogenicity risk among pregnant women visiting antenatal clinic: the case of a primary hospital, Indian J. Pharm. Pract. 8 (1) (2015) 27.
- [23] M. Belay, W. Kahaliw, Z. Ergetie, Assessment of drug utilization pattern during pregnancy in Adama riferral hospital, Oromia region, Ethiopia, Int. J. Pharmaceut. Sci. Res. 4 (5) (2013) 1905.