

Risk category drug prescription and associated factors among pregnant mothers attending antenatal care service in health centers, Bahir Dar city, Northwest Ethiopia: a cross sectional study.

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ABSTRACT

Background: Drug utilization during pregnancy may be unnecessary and dangerous for the fetus. Health care providers must be aware of appropriate pharmacologic therapy for a variety of conditions and the potential impact on the pregnant women and the fetus. Studies in different parts of the world indicate that there is high consumption of risk category prescribed drugs among pregnant women. The objectives of this study is to determine risk category drugs prescribed and associated factors during pregnancy among pregnant women attending antenatal care service among governmental health centers in Bahir dar city administration.

Methods: Institution based cross sectional study was conducted from February 10 to march 10, 2014 in government health centers of Bahir dar city administration. Data were collected by document review of antenatal care follow up cards and exit interview of pregnant women using checklist and structured questionnaires. Data were analyzed using SPSS version16.0. Back ward logistic regression model was used and variables with p-value <0.05 were considered statistically significant.

Results: A total of 510 pregnant women were included in the study (response rate=98.5%); of which 88.4% were prescribed at least one drug during pregnancy. Nearly 11% of the pregnant women were prescribed with drugs from category D or X of the US-FDA risk classification.

Risk category drug prescription during pregnancy were significantly associated with differences in educational level of respondents (AOR= 3.4, 95%CI: 1.8 -6.6), maternal illness on the date of interview (AOR= 10.6, 95% CI: 3.7-30.2), and location of health centers (AOR =3.2, 95% CI: 1.7-6.1).

Conclusion: The proportion of pregnant women who were prescribed drugs with potential harm to the fetus during pregnancy was very high in Bahir dar city administration. Difference in educational status of respondents, maternal illness, and location of health center were found to be statistically significant factors of risk category drug prescription.

Key Words: Pregnancy, Prescription, risk category drug, Bahir dar city.

1. Background of the study

Drug utilization during pregnancy may be unnecessary and dangerous for the fetus [1, 2].The health care provider must be aware of appropriate pharmacologic therapy for a variety of conditions and the potential impact on the pregnant women and the fetus [3, 4].To guide safe drug use during pregnancy, the U.S. Food and Drug Administration (FDA) classified drugs into five major categories A, B, C, D, and X, with categories D and X indicating evidence of risk in pregnancy [5, 6].

US FDA drug risk classification during pregnancy

Category A: Adequate, well-controlled studies in pregnant women have not shown an increased risk of fetal abnormalities.

Category B: Animal studies have revealed no evidence of harm to the fetus; however, there are no adequate and well-controlled studies in pregnant women.

Category C: Animal studies have shown an adverse effect and there are no adequate and well-controlled studies in pregnant women.

Category D: Studies, adequate well-controlled or observational, in pregnant women have demonstrated a risk to the fetus. However, the benefits of therapy may outweigh the potential risk.

Category X: Studies, adequate well-controlled or observational, in animals or pregnant women have demonstrated positive evidence of fetal abnormalities. The use of the product is contraindicated in women who are or may become pregnant.

Teratogenic substance: is a chemical substance that can induce a malformation during development. This definition includes an adverse effect on the developing fetus either in causing a structural abnormality or altering organ functions.

Globally information on the use of drugs during pregnancy is scarce. Despite the absence of adequate studies on the safety and effectiveness of drugs for pregnant women, available evidences show that physicians prescribe, and pregnant women take a surprisingly large number of drugs. An international investigation done in four continents that showed that pregnant women ingest an average of three prescription medications during their pregnancy (range 1-5) and 86% of the women had taken at least one prescription medication during their pregnancies [7]. A study on drug use among pregnant women in Addis Ababa, Ethiopia reported that 71.3% of the pregnant women used at least one drug during their pregnancy. In this study, nearly 4% of the pregnant women were prescribed drugs from category D or X of the US FDA risk classification [8]. Since the majority of women in Ethiopia live with poor access to: health education, modern health care facility and qualified health professionals and the situation of appropriate drug utilization could be worst. No study was found on risk category drug prescription use among pregnant women in Bahir Dar city administration. Therefore this study was conducted to determine the proportion of risk category drug prescription and to identify factors associated with it among pregnant mothers attending antenatal care service at governmental health centers in Bahir Dar city administration.

2. Study Participants and methods

2.1. Study area and setting

The study was conducted in Bahir Dar city administration, North western part of Ethiopia. It is the capital city of the Amhara Regional state. The city is located approximately 565 km Northwest of Addis Ababa, capital city of Ethiopia. Bahir Dar is situated at a latitude and longitude of 11°36'N 37°23'E and an elevation of 1840 meters above sea level. The city is divided in to nine administrative kebeles. Based on the recent census report, projected population of the city is 270,013, of whom 51.1% are women and the remaining 49.9% are men. The number of females in reproductive age are expected to be 64,803 (24% of the total population). Total fertility rate (TFR) for 2012 was estimated to be 2.6 children per woman of reproductive age in the town while the overall national figure was 4.8 children per woman of reproductive age group [9].

Regarding the health institutions there were one governmental referral hospital and two private hospitals; ten governmental health centers as well as more than thirty different levels of private clinics. There are also two reproductive health clinics namely: Family Guidance Association Ethiopia (FGAE) and Marie stops.

2.2. Study design and period

Institution based Cross- sectional study was conducted from February 10 to march 10, 2014 in government health centers.

2.3. Study participants

All pregnant women who came for antenatal care (ANC) service in Bahir Dar city administration were the source populations. All pregnant women who came for ANC services to the selected health centers during the study period were study populations. Pregnant women at any gestational age who were following the ANC service at the selected health centers were included in the study. Pregnant women referred from outside Bahir dar city administration and pregnant mothers who came more than once during the study period were excluded from the study.

2.4. Sample Size determination

Sample size was determined using single population proportion formula. The proportion of risk category drug prescribed during pregnancy was taken as 71.3% [8]. The following assumptions were used: the proportion of pregnant women who were exposed to risk category drug prescription were taken as 50%, level of confidence 95%, a 5% marginal error. Based on these assumptions, the sample size was calculated as: $n = (Z_{\alpha/2})^2 p (1-p) / d^2$. Where; n = the minimum sample size required, P= Proportion of risk category drug prescribed during pregnancy in Addis Ababa (71.3%), d= absolute precision/margin of error = 0.05 and $Z_{\alpha/2} = 1.96$ at confidence level 95%.

Then, $n = \frac{(1.96)^2 (0.713)(1-0.713)}{(0.05)^2} = 314$. The final sample size with design effect of 1.5 and 10%

allowance for data incompleteness and non response, the number of respondents included in the study were $[314 \times 1.5] + 10\% [314 \times 1.5] = [471 + 47.1] = 518$.

2.5. Sampling technique and sampling procedures

Multistage sampling technique was used and all health centers in Bahir dar city administration were listed and stratified as rural and urban. From these health centers two rural and three urban health centers were sampled using simple random sampling method.

Proportional numbers of pregnant women were assigned to each health center based on the flow of pregnant women per day calculated by taking one month ANC record. Systematic random sampling technique was used to select the pregnant women in each health facility.

Data were collected using face to face interview with structured questionnaires and review of antenatal follow up cards of pregnant women with data collection format. The data collection format was used to collect information about number of total antenatal visits, gestational age and medication prescribed during each trimester, while the structured questionnaire was used to collect socio-demographic data, obstetric and medical history of the pregnant women.

For data quality assurance the questionnaire was prepared in English and translated into Amharic language and then back to English check for any inconsistencies or distortions in the meaning of words and concepts. Experienced female nurses were recruited for data collection and trained for one day about the objective and process of data collection. A questionnaire was pre-tested and modifications were done accordingly. Close supervision was undertaken during data collection. Every questionnaire was crosschecked daily by the supervisor and the principal investigator and Problems faced were discussed overnight.

2.6. Ethical consideration

Ethical clearance was obtained from ethics review committee of Amhara national regional state health bureau. Oral consent was taken from the respondents after Formal letter was hand over to the administrators of health centers. All the study participants were informed about the purpose of the study, their right to refuse and assurance of confidentiality. Oral informed verbal consent was obtained from every respondent. Strict confidentiality was assured through anonymous recording and coding of questionnaire.

2.7. Data management and Analysis

Data were coded, entered into EPI Info (Epidemiological information. version 3.5.2) and analyzed using SPSS (version 16.0).

Bivariate analysis was computed to test whether there is association between dependent variable and each independent variable. Factors associated with risk category drugs prescribed during pregnancy at bivariate analysis were identified and the variables with p-value of 0.2 and less were taken to multivariate analysis. Multivariate logistic regressions were computed to identify factors associated with risk category drug prescribed during pregnancy. The model was built with backward stepwise elimination (backward LR). Finally, P-value < 0.05 was considered as statistically significant.

3. Results

A total of 510 (response rate=98.5%) pregnant women were interviewed and all ANC cards of these participants were reviewed in this study.

Socio demographic characteristics

The majority of the respondents (77.5%) were in the age group of 20 and 34 while 49 (9.6%) of them were 19 and below. The mean (+ SD) age was 26.5 (± 6.0). Four hundred sixty eight (91.8%) respondents were married and 40(7.8%) were single.

Regarding their educational status, 151(29.6%) were unable to read and write, while 37 (7.3%) of them were able to read and write only. One hundred eight (21.2%) completed primary education, 103(20.2%) had completed secondary school, while 111 (21.8%) had attended higher level education (**Table-1**).

Table1: Socio-demographic characteristics of pregnant women attending ANC Service in Bahir Dar city administration health centers, February to March 10, 2014, North West Ethiopia.

Variable	Number of women	Percent
Age		
≤ 19	49	9.6
20-34	395	77.5
35 – 42	66	12.9
Marital status		
Married	468	91.8
Single	40	7.8
separated	01	0.2
Educational status		
Unable to read and write	151	29.6
Able to read and write	37	7.3
Primary education	108	21.2
Secondary education	103	20.2
Higher level	111	21.8
Occupation		
Government employed	92	18
NGO employed	49	9.6
Merchant	97	19
House wife	210	41.2
Student	38	7.5
Unemployed	17	3.3
Others*	07	1.4
Monthly income (ETB)		
< 800	118	23.1
800 – 1000	151	29.6
1001-2000	168	32.9
>2000	73	14.3

*Others include: house servant and daily laborer

Obstetric and medical history

Sixty five (12.7%) of the pregnant women had history of chronic disease. Majority of the pregnant women (54.3%) were primigravida and 233(45.7%) were multi-gravida.

Three hundred sixty two (71%) of the pregnancies were wanted, 78(15.3%) were mistimed; and 70 (13.7%) were unwanted pregnancies. Forty three (8.4%) of the respondents were hospitalized during their pregnancy. Three hundred ninety nine (78.2%) of the respondents had 1-2 total ANC visits, and 111 (21.8%) of them had 3-4 total ANC visits on the date of interview. Three hundred forty nine (68.5%) of the pregnant women visited the health institutions for routine ANC follow up, 146 (28.6%) of them because of perceived illness, 21(4.1%) referred from other health institutions of Bahir dar city administration, and 2 (0.4 %) visited for other reasons. (Table-2)

Table2: Obstetric and medical histories of the pregnant women attending ANC service in Bahir dar city administration February to March 10, 2014, Ethiopia.

Variable	Number of women	Percent
History of chronic disease		
Yes	65	12.7
No	445	87.3
Gravida		
Primigravida(1)	277	54.3
Multi-gravida(2-8)	233	45.7
Pregnancy status		
Wanted	362	71
Mistimed	78	15.3
Unwanted	70	13.7
History of hospitalization		
Yes	43	8.4
No	467	91.6
Number of antenatal visits		
1-2	399	78.2
3-4	111	21.8
Reason for visiting health center on date of interview		
Ill filling	146	28.6
ANC visit	349	68.5
Referred	21	4.1
Others	2	0.4

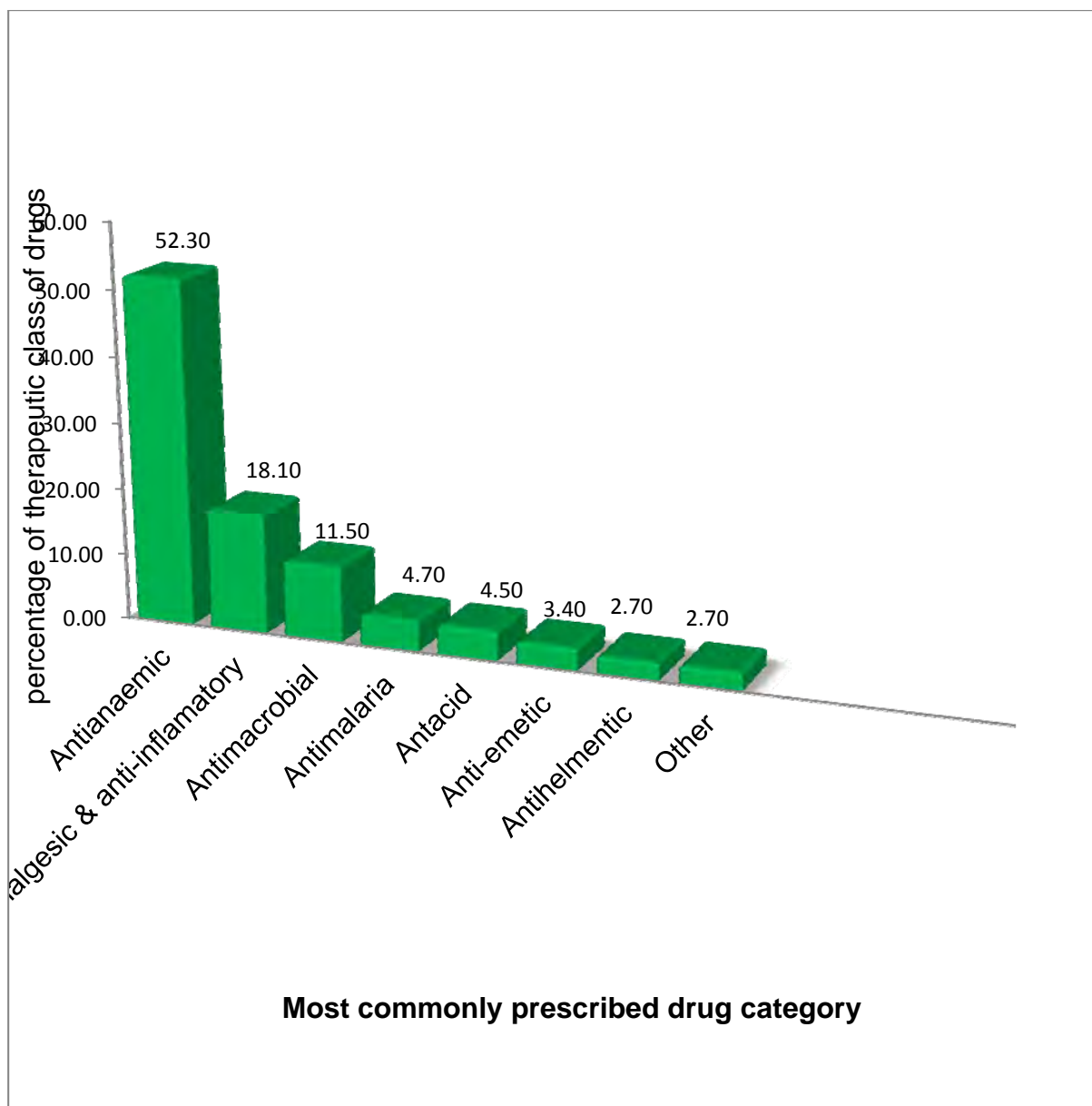
Frequency and type of drugs prescribed during pregnancy

A total of 451(88.4%) pregnant women were prescribed at least one drug during their current pregnancy. Three hundred fifteen (61.8%) of the respondents were prescribed at least one drug excluding iron prescription only during their current pregnancy.

Among those pregnant women who were prescribed drugs during their current pregnancy, 103(22.8%), 166(36.8%), 128(28.4%), 43(9.5%), 8(1.8%) and 3(0.7%) were prescribed 1, 2, 3, 4, 5 and 6 drugs respectively.

Thirty three different types of drugs (a total of 1049) were prescribed for the respondents. The mean number of drugs prescribed during pregnancy was 2.3. The most commonly prescribed classes of drugs during first trimester of pregnancy were anti-anemic, analgesics, anti-bacterial agents and anti-emetics. During second trimester, anti-anemic, analgesic, anti-bacterial, and ante-malaria were among the frequently prescribed class of drugs while anti-anemic, analgesic, and anti-bacterial and anti-helminthics were among the most frequently prescribed drugs during third trimester.

Considering all trimesters the most commonly prescribed and recorded class of drugs during pregnancy were anti-anemic preparations (52.3%) followed by analgesics and anti-inflammatory (18.1%). (Figure-1)



Others include: - antispasmodics, laxatives, anti-protozoa, vitamins cough syrups, ant-hypertensive and anti-asthmatics.

Figure 1: Percentage of commonly prescribed therapeutic class of drugs to pregnant women attending ANC service in health centers, February to March 10, 2014, Bahir Dar city, Ethiopia.

Category of drugs prescribed during pregnancy based on U.S. FDA pregnancy risk classification of drugs.

About 554(52.8%), 354(33.7%), 82(7.8%), and 56(5.3%), of the drugs were prescribed to pregnant women drugs from US FDA category A, B, C, and D respectively.

US FDA Category D or X drugs were prescribed during all trimester of pregnancy with the highest frequency during the second trimester. Drugs in US FDA category D or X which were commonly prescribed include quinine and co-trimoxazole (trimethoprim+ sulphamethoxazole) [Table 3].

Table 3: Drugs prescribed according to US FDA risk category and gestational age among pregnant women attending ANC service in health centers from February to March 10, 2014, Bahir Dar city, Northwest Ethiopia.

(N= 1049 (total no of drugs))

US FDA RISK CATEGORY	TRIMESTER			
	First n(%)	Second n(%)	Third n(%)	All trimester n (%)
A	216(20.6%)	217(20.7%)	121(11.5%)	554(52.8%)
B	99(9.4%)	151(14.4%)	104(9.9%)	354(33.7%)
C	18(1.7%)	36(3.4%)	28(2.7%)	82(7.8%)
D or X	12(1.1%)	28(2.7%)	16(1.5%)	56(5.3%)
*N	1(0.1%)	1(0.1%)	1(0.1%)	3(0.3%)

*N (3) = drugs not categorized by US FDA.

A total of 56(10.9%) of the pregnant women were prescribed with US FDA category D or X drugs and 2 pregnant women were prescribed with 40 % glucose and plummy nut which were not categorized by the US FDA risk category (Table 4).

Table 4: Pregnant women exposed to drugs according to US FDA risk category and gestational age among pregnant women attending ANC service in health centers from February to March 10, 2014, Bahir Dar city, Northwest Ethiopia.

(N= 510 (total no of pregnant mothers))

US FDA RISK CATEGORY	TRIMESTER			
	First n (%)	Second n (%)	Third n (%)	*All trimester n (%)
A	216(42.4%)	217(42.5%)	121(23.7%)	554(108.6%)
B	99(19.4%)	151(29.6%)	104(20.4%)	354(69.4%)
C	18(3.7%)	36(7.1%)	28(5.5%)	82(16.1%)
D or X	12(2.4%)	28(5.5%)	16(3.1%)	56(10.9%)

*A pregnant woman could be exposed to more than one category of drugs

* Only one pregnant mother was exposed to category D or X twice her pregnancy but others were exposed once.

The most frequently prescribed category of drugs was US FDA category A during first and second trimesters and US FDA category B during second trimester of pregnancy. Considering all trimesters of pregnancy drugs with US FDA category A were the most frequently prescribed drugs. The frequently prescribed drugs include iron/fezol, from US FDA category A; Paracetamol and amoxicillin from US FDA category B drugs. US FDA Category D or X drugs were prescribed during all trimester of pregnancy with the highest frequency during the second trimester. Drugs in US FDA category D or X which were commonly prescribed include quinine and cotrimoxazole (trimethoprim+ sulphamethoxazole) (Figure 2).

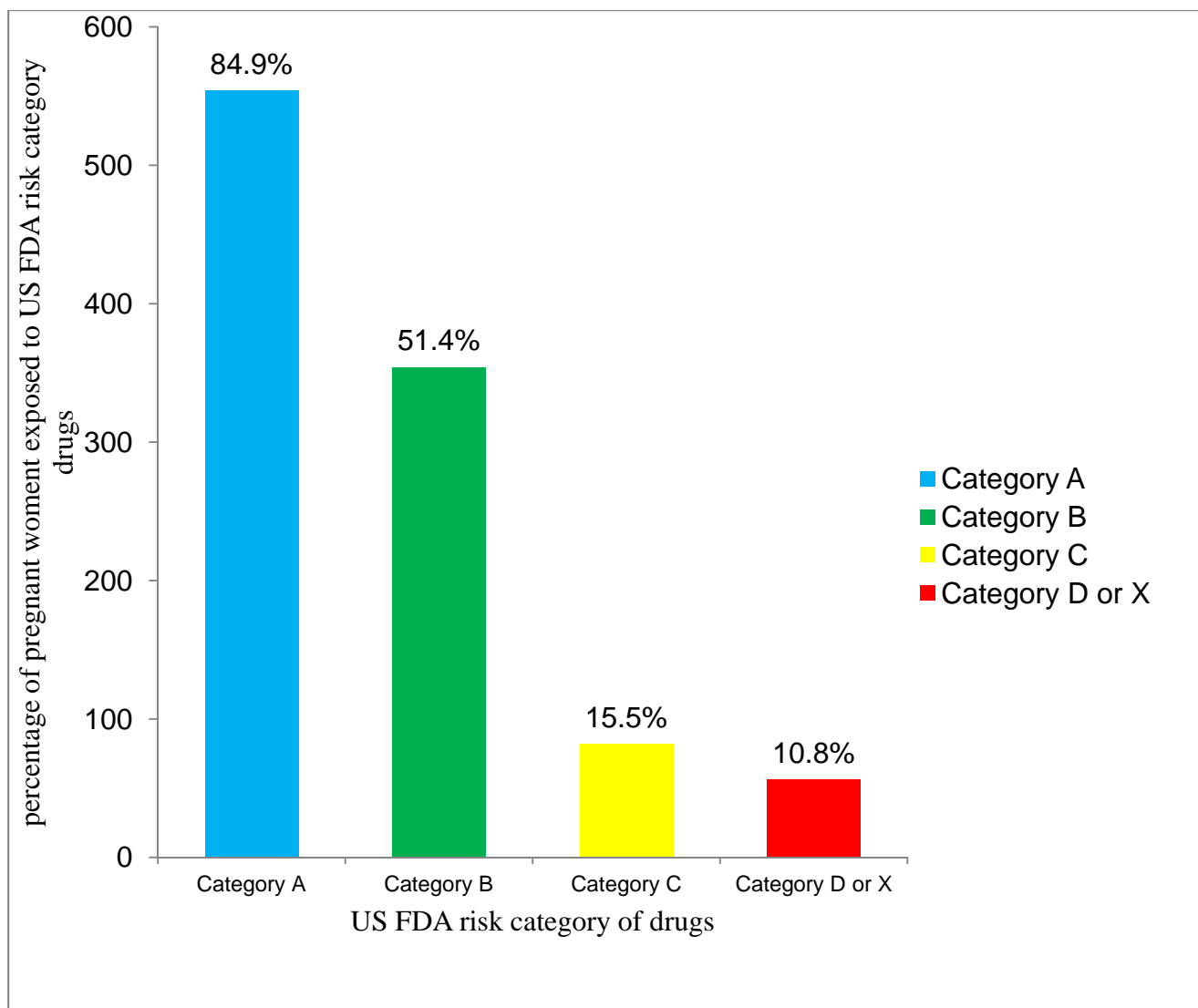


Figure 2: Percentage of Pregnant women exposed to drugs according to US FDA risk category among pregnant women attending ANC service in health centers from February to March 10, 2014, Bahir Dar city, Northwest Ethiopia.

*A pregnant woman could be exposed to more than one category of drugs

Two pregnant women were prescribed with 40 % glucose and plummy nut which were not categorized by the US FDA risk category.

Factors determining US FDA category D or X drugs prescribed during pregnancy

According to this study, multivariate logistic regression analysis revealed that differences in educational level of health care provider, health facility type/location, maternal illness on the date of interview and educational level of respondents were significantly associated with drugs prescribed from US FDA risk category D or X. Pregnant women who have no formal education were three times more likely to be prescribed drugs from US FDA risk category D or X compared to those who have formal education (AOR = 3.4; 95% CI: 1.8-6.6) and pregnant women who had maternal illness on the date of interview were ten times more likely to be prescribed with drugs from US FDA risk category D or X compared to those who had no maternal illness on the date of interview (AOR = 10.6; 95 % CI: 3.7-9.2).

Similarly, pregnant women who had got service in the rural health centers were three times more likely to be prescribed with drugs from category D or X compared to those who had got service in the urban health centers (AOR = 3.2; 95 % CI: 1.7-6.1). Pregnant women who had got services by diploma holders were two times more likely to be exposed with drugs from category D or X compared to those who had got service by degree holders (AOR= 2.8; 95%CI: 1.4-8.1)

(Table 5).

Table 5: Association between US FDA category D or X drugs prescribed during pregnancy and selected variables among pregnant women attending ANC service in health centers from February to March 10, 2014; Bahir Dar city, Northwest Ethiopia.

Variables	FDA category D or X drug prescribed		OR (95% CI)	AOR
	Yes	No	COR	
Chronic disease				
No	33	328	1	1
Yes	21	128	1.6(0.9- 2.9)	1.3(0.6-2.5)
Facility type/location				
Urban	24	359	1	1
rural	30	97	4.6(2.6-8.3)	3.2(1.7-6.1)
Provider level				
Degree	12	77	1	1
Diploma	62	359	1.1(1.5-2.6)	2.8(1.4-8.1)
Hospitalization				
No	45	422	1	1
Yes	9	34	2.5(1.1-5.5)	1.1(0.4-2.8)
Maternal illness				
No	4	243	1	1
Yes	50	213	14.3(5.1-40.1)	10.6(3.7-9.2)
Educational level of respondents				
No formal education	38	150	4.8(2.6-8.9)	3.4(1.8-6.6)
Formal education	16	306	1	1

4. DISCUSSIONS

The finding of this study showed that a total of 451(88.4%) pregnant women were prescribed with at least one drug during their current pregnancy. Excluding iron only prescription, 315(61.8%) of the pregnant women were prescribed at least one drug during their current pregnancy. This finding is higher than the study done in Addis Ababa which revealed that 71.3% of the respondents took at least one drug during their pregnancy [8]. This relatively higher extent of drug use may be due to the implementation of iron/feol supplementation policy. However, this study is consistent with other studies conducted in Norway and Sweden 86 %, Germany 85 % [11, 12]. But the finding of this study is lower than a study done in Hungary 92% and Brazil 94.9 % [2, 13].

Commonly prescribed drugs to the pregnant women during their pregnancy were anti-anemic followed by analgesic drugs, anti-bacterial, anti-malaria and antacids. This is consistent with the study done in Addis Ababa and Pakistan [8, 14]. This might be due to anemia; head ache and gastritis are the common physiologic problems during pregnancy.

This study indicated that the drugs prescribed during pregnancy were US FDA category A with the highest frequency followed by US FDA category B, US FDA category C and US FDA category D or X. Special concern was given to drugs belonging to categories D and X of the US FDA risk classification which showed similar trends in a study done Addis Ababa [8].

A total of 56(10.8%) pregnant women were prescribed drugs from US FDA category D or X. The finding of this study is higher than studies conducted in developed and developing countries including Addis Ababa, Ethiopia (4.0%), Pakistan (0.8%) and US (4.8%) [8, 14, 15].

The present study documented that the proportion of women prescribed US FDA category D or X drugs during pregnancy were 10.8% which is not comparable to the findings of a study conducted in Addis Ababa [8]. Among the 56 drugs prescribed from US FDA category D or X drugs, 49(87.5%) were quinine tablets prescribed to treat malaria, this could be because the prevalence of malaria in Bahir dar city administration is high compared to that of Addis Ababa and there might be difference in diagnostic methods. The rest of the prescriptions provided to the pregnant women who were categorized under US FDA category D include doxycycline and co-trimoxazole (trimethoprim and sulphamethoxazole combination) prescribed during pregnancy and all accounted for 12.5% of the group.

But this finding was comparable with a study done in Nigeria, which showed that 13% of pregnant mothers were prescribed from category D [16].

Our findings indicated that there is significant association between risk category drug prescription during pregnancy and educational level of providers, educational level of respondents, and maternal illness on the date of interview and location of health centers. These findings were supported by other similar studies [2, 8, 17].

These might be due to as educational level of respondents increase risk of maternal illness decreases and risk of drug use decreases.

5. CONCLUSIONS

Risk category D or X drugs prescription during pregnancy was found to be high in health centers of Bahir Dar city. Risk category drug prescription during pregnancy was significantly associated with differences in educational level of providers, educational level of respondents and maternal illness on the date of interview and location of health centers. Proper utilization of malaria prevention methods should be strengthened as anti malarial drugs are the most frequently prescribed US FDA category D or X drugs to the pregnant women in this study. The regional health bureau and Bahir Dar city administration health office should improve educational status of health care providers. Formal education for women should be encouraged and health education should be given to the pregnant mothers to prevent illness in the rural areas.

ACRONYMS

AOR	Adjusted Odds Ratio
ANC	Antenatal Care
COR	Crude Odds Ratio
ETB	Ethiopian Birr
FDA	Food and Drug Administration
NGO	Non Governmental Organization
OR	Odds Ratio
SPSS	Statistical Package for Social sciences
US	United States
WHO	World Health Organization

Competing interest

The authors of this article declare that they have no any competing interests.

Authors' contribution

CA: Conceptualized the research problem, designed the study, prepared the proposal, conducted field work, collected data, analyzed the data and involved in the preparation of manuscript.

WD: Revised the proposal, involved in data analysis, revised the report, drafted and prepared the manuscript for publication

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