Addis Ababa University

College of Health Science,

School of Medicine,

Department of Family Medicine

Bith prevalence of neural tube defect and associated factors at ALERT Hospital, Obstetrics and Gynecology Department.

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LIST OF ACRONYMS

ALERT-All African leprosy, TB and rehabilitation training

AAU- Addis Ababa University

WHO- world health organization

NTD- neural tube defect

GA- Gestational age

ANC- Antenatal care

CI- confidence interval

A.A- Addis Ababa

MOH- Ministry of health

BMI- Body mass index

P - Prevalence

ETB- Ethiopian beer

PI- Principal Investigator

BMI-Body mass index

BSc- Bachelor of science

SPSS- Statistical Package for Social Science

ABSTRACT

Background: Neural tube defect(NTDs) is birth defect of spine, brain or spinal cord. It occurs within first month of pregnancy in developing fetuses. About 10% of infant death worldwide is due to nervous system related cases. NTDs are associated with folic acid deficiency before and during pregnancy. Even if there is extensive information worldwide, the data in our country is limited.

Objective: The aim of the research was to assess the birth prevalence of neural tube defect and associated factors.

Methods: A hospital based cross sectional retrospective study was conducted at ALERT specialized hospital from June 2022 to 2023 G.C. Data was collected from delivery logbook and chart review. The gathered data underwent thorough checks for completeness and consistency before being cleaned, coded, and imputed using SPSS software version 26. Variables were interpreted per 1000pregnancies

Result:

The overall prevalence of NTDs was 13.8(with 95% CI, 13-14.49) per1000 deliveries and prevalence of each type of NTDs were Anencephaly 6.5(95% CI, 5.8-7.2) per 1000 deliveries, Spina bifida 3.7(95% CI, 3.01-4.39) / 1000 deliveries, Encephalocele 0.8(95% CI, 0.11-1.5) / 1000 deliveries, and both Spina bifida and Anencephaly 2.8(95% CI, 2.11-3.5) per 1000 deliveries. Among total deliveries (n = 7500), there were 49 anencephaly cases, 28 Spina bifida cases, 6 Encephalocele cases, and 21cases affected by both Spina bifida and anencephaly.

Conclusion:

The prevalence of NTDs in this study was among the highest globally reported. The total Prevalence was 13.8 per 1000 pregnancies. Anencephaly was the commonest neural tube defect which was similar with other literatures ANC follow up, Folic acid use and preconception care were having low coverage.

Key words: neural tube defect, prevalence, associated factor at ALERTSH

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1. Introduction:

1.1 Baground

Neural tube defect (NTDs) is a birth defect of the spine, brain or spinal cord. It occurs in the first month of pregnancy in developing fetuses. Spina bifida and Anencephaly are commom neural tube defects. NTDs are associated with folic acid deficiency before and during pregnancy, so it is important to ensure they are getting enough folic acid through supplements and in their diet before and during pregnancy**.**

A systematic review and met analysis done in 2016 showed that prevalence of neural tube defect ranges: Eastern Mediterranean (2.1-124.1; 21.9/10000births), Europe(1.3-35.9; 9.0/10000births), America(3.3-27.9;11.5/10000births), South-East Asian(1.9-66.2;15.8/10000 births), Western Pacific (0.3-199.4;6.9/10000 births), and African (5.2-75.4; 11.7 per 10,000 births)(Ibrahim zaganjor et al 2016).

There different types of neural tube defects are, spina bifida, anencephaly, encephalocele and iniencephaly. The common type of neural tube defect (NTD) is spina bifida. Anencephaly occurs when the fetal neural tube fails to close at the top during fetal development. An encephalocele occurs when the neural tube near the brain fails to close and there is an opening in the skull. Iniencephaly occurs when the spine is severely deformed (Cleveland Clinic, AAFP 2017, Obstetrics Essential 2017).

The New York Academy of Sciences conducted a systematic and meta-analysis showing that significant morbidity, mortality, disablity, and psychological and economic cost are associated with neural tube defect.Most of them are preventable with folic acid (Vijaya Kancherla et al. 2018).

In Africa, the combined birth prevalence of neural tube defect was 21.42per 10000deliveries. There was a high compined birth prevalence of neural tube defect in Algeria 75, Ethiopia 61.43, Eritrea 39 and Nigeria 32.77 per 10,000 births{Mohammed Oumer et al 2021}. Similarly systematic review and meta-analysis performed in East Africa, the compined prevalence of neural tube defect per 10000 births were 33.30. The highest rate was found in Ethiopia with 60 per 10000birth. {Paddy sentongo et al 2022}.

A retrospective cross-sectional study performed at Debre Berhan Hospital ,the prevalence of neural tube defect was 10.9/1000 births. In this research, instance of Anencephaly were the predominant form of neural tube defects (NTDs). (Zerihun Kindie et al. 2021).

Ahospital based case control study with a prospective design were conducted in Addis Ababa and the overall prevalence of neural tube defect was126 /10000 births. The occurrence rate of neural tube defect (NTDs) was 63.4/10000 birthes.{Abel et al 2017}.

1.2 Statement of the problem

A neural tube defect (NTDs) is a structural anomaly of the central nervous system that impacts the developing embryo during the first month of the developmental process. The causes of NTD are not well understood, but pregnant women who are not taking folic acid supplements, have a personal or family history of NTD, have medical complications during pregnancy like DM, Epilepsy, chemical exposure, radiation exposure, taking medication, or drug abusers are at high risk of NTD. It is more prevalent in rural areas but still occurs in urban areas and is related to women's educational status. Although extensively studied worldwide, data are limited on prevalence and prevention of neural tube defect (NTDs) in Ethiopia (Zerihun Kindie et al. 2021). Studies conducted in Africa and East Africa indicates that Ethiopia is the second and first prevalence of NTD respectively {Mohammed Oumer et al 2021}. In developed countries, the prevalence is decreasing due to the fortification of foods with folic acid, but the prevalence is still high in developing countries. Nearly 10% of infant mortality globally is due to central nervous system causes.

Different measures are currently being taken worldwide to reduce NTD, particularly preventive measures, folic acid supplementation, fortification of foods with folic acid are recommended, but coverage is still low and the cause and risk factors are not yet well studied (WHO 2018, CDC, 2022) .In our country, folic acid supplementation after conception, ANC follow-up, screening for modifiable risk factors before conception, disease and medication management, lifestyle and behavior changes, treatment of psychological aspects, and folic acid supplementation (Obstetrics Management Protocol 2021). But there is still a gap in implementation as people's awareness of NTD is low and fortification of foods with folic acid has not started yet.

1.3. Significant of the study

Although the prevalence of neural tube defects is widely studied worldwide, data in our country is limited, but studies in Africa and East Africa show that the prevalence is highest in Ethiopia. So the study would provide information, the prevalence neural tube defect and related factors and result will serve as input to researchers and the MOH to develop guidelines to prevent neural tube defect

2. Literature review

2.1. Prevalence and associated factor of neural tube defect

The New York Academy of Sciences conducted a systematic and meta-analysis showing that significant morbidity, mortality, disability, and psychological and economic cost are associated with neural tube defects. A systematic review revealed that there is lack of high-quality data in the world with highest exposure. Despite knowledge about prevention, NTDs remain widespread worldwide (Vijaya Kancherla et al. 2018).

A systematic meta-analysis conducted in Europe (1998-2017), around 95,213 pregnancies were with neural tube defect out of 104 million pregnancies in 28 Europe countries which gives the pooled prevalence of NTD was 0.92/1000 pregnancies. There is a lack of data regarding women who took folic acid supplements before conception and during the initial trimester of pregnancy. A meta– analysis suggests that approximately 25%of women do so. (Joan .K. Morris et al. 2021).

A systematic review and meta-analysis conducted in Africa shows that a high pooled birth prevalence of neural tube defects was found in Algeria 75, Ethiopia 61.3, Eritrea 39 and Nigeria 32.77 per 10,000 births. The prevalence increased through time. Folic acid use,, consanguinity, male sex, and substance use during pregnancy substance were assessed and none of these were significantly affected {Mohammed Oumer et al. 2021}.

A systematic review and meta-analysis conducted in Africa shows that the combined prevalence of neural tube defect (NTDs) in Africa stood at 50.71/10000births. Folic acid supplementation, maternal exposure to pesticides, mothers with a history of stillbirth, and

maternal exposure to X-ray radiation were shown to be determinants of NTDs which was incidental exposure (Daniel Atlaw et al. 2021).

A systematic review and meta-analysis observational (cohort, cross-sectional, nested case-control) studies conducted in East Africa found that the combined (pooled) prevalence of neural tube defects (NTDs) at birth was 33/10000pregnancies. The prevalence rate of NTDs was highest in Ethiopia at 60 per 10,000 and lowest in Malawi (5 per 10,000 births). It can be hypothesized that this is due to a lack of generally accepted practice to fortify foods with folic acid or to promote folic acid supplements for pregnant women {Paddy sentongo et al 2022}.

A prospective study in Rabat, Morocco, with 43,923 births in the study period and out of this 44 cases were neural tube defects with incidence rate of 1/1000births. In this research there was female sex predominance. The common NTDs was Anencephaly(50%) followed by Spina bifida (38.6%) and Encephalocele (11.4%). Risk factors identified was, blood relationship (34%), plant consumption (36%), diabetes mellitus and medication. In 6.8% of the cases malformation was reported in the family. Mean age of the mother was 30-38±6.88 and mean gestational age was 36.8±5.11. In this research 59% of women did not take folic acid supplementation in the first trimester of pregnancy. (Khenata Forci et al 2021).

A systematic cross-sectional analysis and meta-analysis performed in Ethiopia estimated the pooled prevalence of neural tube defects in children in Ethiopia at 63.3 cases per 10,000 children in descending order of spinal bifida, anencephaly, and Encephalocele, respectively. In this research, factors associated with NDTs was unplanned pregnancy, family history, use of folic acid, alcohol use and herbal medication were associated to all form of congenital malformation. By using the random -effect model, it was determined that child sex, maternal age at gestation, multiparity, and still birth history are not risk factors (Zebenay Workneh Bitew et al .2020).

A retrospective cross-sectional study performed at Debre Birhan Hospital found an overall neural tube defect prevalence was 10.9/1000 pregnancy and prevalence of each neural tube(NTD) defect was anencephaly, Spina bifida and Encephalocele in decreasing order. Risks associated with NTD are: multiparous, Primiparous, no use of folic acid before conception or in the conception period and no prenatal care were found in the study (Zerihun Kindie et al. 2021).

A cross- sectional study done from 2016-2017 in Tigray, northern Ethiopia, the prevalence of infants born with anencephaly and Spina bifida was 66.4 and 64.4 per 10,000 births, respectively. In this research, the overall incidence rate of neural tube defect (NTDs) 131/10000 births, of which 23% were live births and 77% were still born. Adigrat Hospital located in eastern zone of Tigray, recorded the highest incidence of neural tube defect (NTDs). There was male sex predominant with 65%. Anatomically, lumbar 43%, cervical 29% and thoracic 28% (Birhane et al. 2018).

A case-control study conducted in four selected government hospitals in the Amhara region to know the determining factor of a neural tube defect shows that neonates born to illiterate mothers were 81% more likely to have NTDs than neonates born to mothers who attended higher education. Female newborns were twice as likely to have NTDs compared to male newborns, women who had no prenatal screenings were twice as likely to have newborns with NTDs compared to those who had prenatal screening, the odds of NTDs were in newborns 63% lower whose mothers had taken folic acid before or during pregnancy had a 4-fold greater likelihood of newborns with a history of NTDs compared to women who did not receive folic acid supplementation, the likelihood of NTDs was 58 % lower in newborns whose mothers have never used any substance during pregnancy compared to those who have used substances (drugs, alcohol, khat and cigarettes) and medical conditions during pregnancy are at high risk of NTDS (Abay Woday Tadesse et al. 2020).

A case-control research was done among 381 (127cases and 254 controls) at Debre Berhan Specialized Hospital from June 2019 to June 2021. Mothers who took medication during pregnancy, mothers who did not eat a balanced diet during pregnancy, and mothers who did not take folic acid before and during the first trimester of pregnancy were significantly associated with neural tube defects (Getaneh Baye Mulu1, et al 2022) .

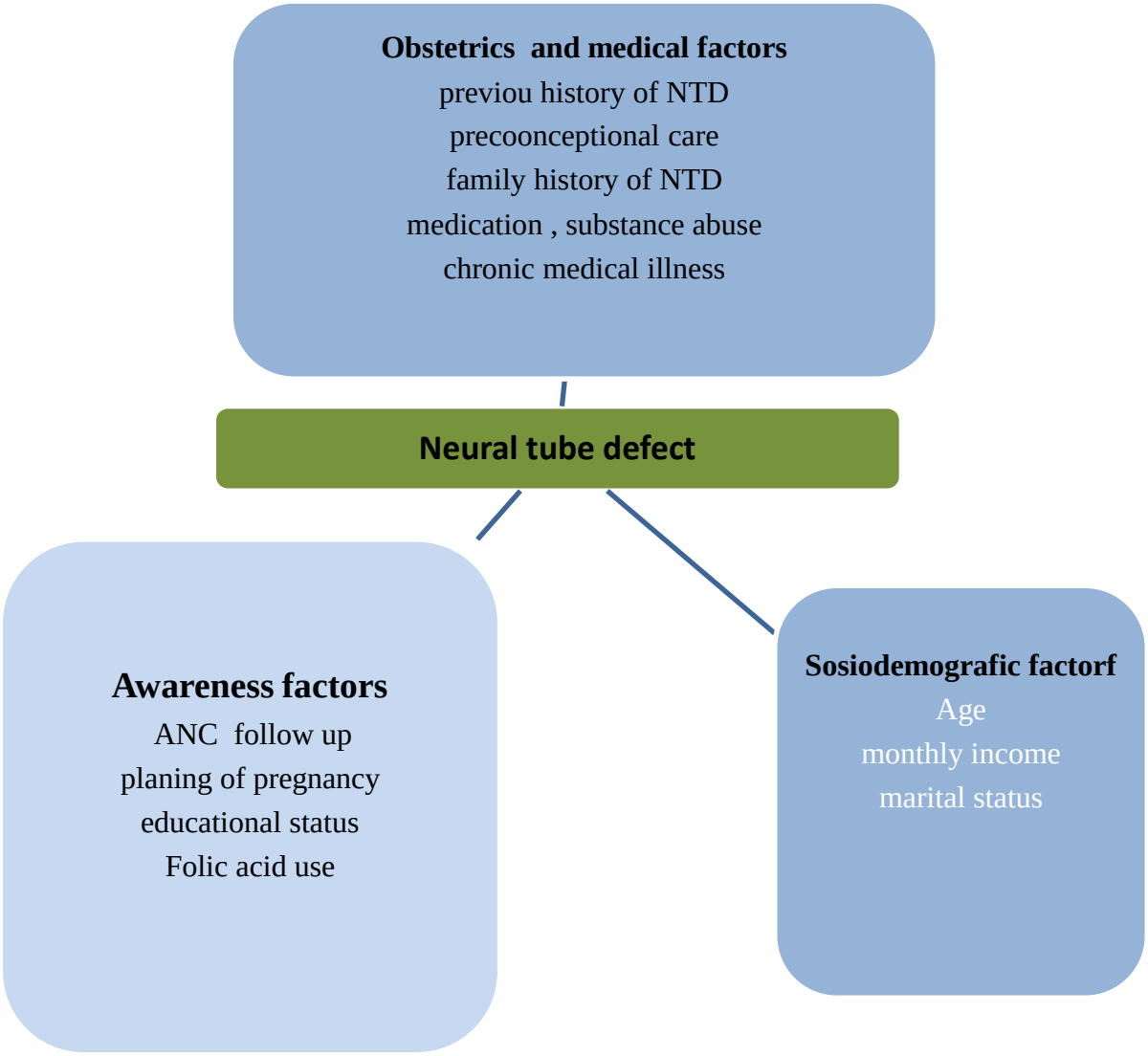
A hospital-based case-control study was conducted with 243 (81 cases and 162 controls) subjects in hospitals in the North Shoah Zone. Various factors have been identified as being associated with a neural tube defect. Family annual cash income, history of stillbirth, history of abortion, tea consumption prior to conception, and pesticide/chemical exposure had significant impact on NTDs. Preconception screening and folic acid use, iron use,

multivitamin intake, during the current pregnancy showed a protective effect (Aynalem Gashaw, et al. 2020).

A case-control study conducted at Zewditu Memorial Hospital showed that maternal hyperthermia, family history of NTDs, coffee consumption, maternal age < 19, and 25-29 were associated with an increased risk of NTDs, while maternal antipyretic drug use had a protective effect. Therefore, periconceptional maternal screening for genetic factors and medical conditions is important for women of reproductive age (Filmawit Aynalem Tesfay et al. 2021).The main aim of this study was to show associated factor of NTDs not prevalence.

Two research studies were conducted at three Teaching Hospitals in Addis Ababa: a prospective cross-sectional study and a hospital based cases control study found an overall rate of NTDs at 12 weeks gestation of was 126 / 10,000 births. Excluding medically terminated cases, the birth prevalence of NTDs was 63.4 per 10,000 births. Anencephaly, Spina bifida, and Encephalocele were the common type of neural tube defects (NTDs). Associated factors found were annual income, drug use within three month of pregnancy, male sex, BMI and unplanned pregnancy were independent predictors of neural tube defects (Abel Gedefaw et al. 2018).

2.2. Conceptual frame work



3. Objectives

3.1. General objective

The general objective of this study was to assess birth prevalence and associated factor of neural tube defect at ALERT Specialized hospital, Addis Ababa, Ethiopia.

3.2. Specific objectives

-To know the prevalence of neural tube defect at ALERT Specialized hospital from June 2022 to June 2023 in Addis Ababa, Ethiopia

-To know neural tube defect associated factors at ALERT Specialized hospital from June 2022 to June 2023, Addis Ababa, Ethiopia

4. Methodology

4.1. Study area

The research was conducted at Labor and Maternity Ward of ALERT Specialized hospital, which is one of the government hospitals located in Zenebework , Kolfe Keranyo subcity in, Addis Ababa, Ethiopian which is home for more than 6 million people. The hospital was known primarily for its dermatology service, but currently it offers all services of specialties and sub-specialties. It is one of the top three hospitals in the city by its maternal service. The hospital provides services to1700 patients daily and 450000patients annually for all people living in the city and those living near the city and that was why we choose the area to conduct the study.

4.2. Study period

- The study was conduct on birth prevalence of neural tube defect from June 2022-June 2023G.C.

4.3. Study design

- A retrospective cross sectional study was conduct to describe the birth prevalence and associated factor of neural tube defect at labor and delivery ward at ALERT specialized hospital.

4.4. Source and study population

4.4.1. Source population

All delivering mother delivered at ALERT specialized hospital during the specified study period

4.4.2. Study population

All parturient attended labor at ALERT Specialized Hospital, Obstetrics and gynecology ward, during the study period regardless of the outcome live, dead or abortion. From the total number of clients NTDs prevalence was studied

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

- All birth out come with the diagnosis of neural tube defect
- GA>12weeks

4.5.2. Exclusion criteria

- Congenital anomaly other than **NTD**
- Ambiguities' or NTG with other congenital anomaly
- Whose chart had lost

4.6. Determination of sample size

The predicted number of deliveries attending at alert hospital during the study period was less than 10,000. The sample size was calculated by using Daniel formula.

$$n = \frac{z^2 * p(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 * 0.5(1-0.5)}{0.05^2} = 384$$

P, is the estimated prevalence of the diseases, 50%, taken due to lack of previous studies to the study area

n , the sample size = 384, after adding 10% lost ,sample size will be 422

Corrected sample size by reduction formula for finite population <10000 is n= 422/1+((422-1)/10000)=404, final sample size is **404**

z = 1.96 with 95 % confidence interval

d, is margin of error = 0.05 with 95 % confidence interval

But due to rare cases and small sample size calculated, But due to rare cases and small sample size calculated, All laboring mother (7500) regardless of the outcome was included and NTD was taken for analysis out of the total number of clients (7500); despite the different outcome;(dead, abortion or alive) , NTD prevalence was studied out of all deliveries. Since the expectation of NTD very small, I decided to take all ladies attended labor regardless of the outcome and analyzed prevalence of NTD out of all. I just showed how the sample size for single proportion survey study was calculated, Otherwise, I took all laboring mother for my study (7500 delivery logbook and charts were reviewed by convenience sampling method).

4.7. Sampling technique

The sample was collected by convenience sampling method in retrospective cross sectional study.

4.8. Study variable

4.8.1. Dependent variable

- Neural tube defect

4.8.2. Independent variable

- **Socio demographic factors: age,** sex of fetus, residence, marital status
- **Clinical/Maternal condition**: Comorbid illness, Planed pregnancy, ANC follow up, previous history of NTD, preconception care, family history of NTD
- **Medication related:** drug use, folic acid supplementation,
- **Environmental factors**: chemical exposure, radiation exposure, substance abuse, alcohol use

4.9. Operational definition

- **Birth defect**: Refers to a structural or functional abnormality present at birth, identified through medical examination or diagnostic testing or imaging.
- **Neural tube defects (NTDs**) : Identification of specific structural abnormality in the neural tube through medical imaging or clinical examination.
- **Preconception care**: Involves comprehensive medical and lifestyle intervention provided to individuals or couples before pregnancy.
- **Previous history:** identification and documentation of instances where self or member of family had experienced neural tube defect
- **Folic acid supplementation:** use of folic acid at least 1month before conception or 3month after conception.
- **ANC:** Refers to scheduled and systematic monitoring of pregnant women's health and developing fetus during the course of pregnancy

4.10. Data collection

Data was collected from May2023 to July2023 by trained BSc midwives from medical delivery logbook and charts by convenient sampling method at ALERT Specialized hospital**.**

4.11. Data processing and analysis

The gathered data was verified, cleaned, checked, coded and imputed using SPSS software version 26 for analysis. The result was presented with table and graph. Bivariate and multivariate analysis was applied for analysis of study variables.

4.12. Ethical consideration

Ethical clearance was obtained from the research ethics committee of the department of family medicine at Addis Ababa University's college of health science and support and permission letter was obtained from ALERT specialized hospital.

4.13. Dissemination of the result

The result was disseminated to Addis Ababa University, College of health science, department of family medicine and ALERT Specialized hospital.

5. Result

5.1. Prevalence of neural tube defects and associated factors

A total of 7500 medical charts and delivery logbooks of normal deliveries medically terminated and abortion cases were assessed during the study period. Here abortion referred after 12th week of gestation and less than 28week. Out of 7500 cases, 104 pregnancy outcomes were NTDs. From those 104 cases of NTDs, 21 were abortion and rest were deliveries and medically terminated cases.

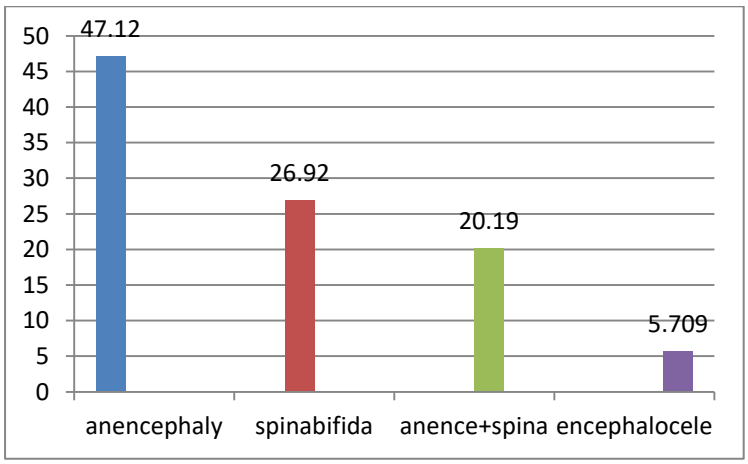


Figure5.1 Type of neural tube defect in percentage

Out of 104 NTDs 47.12 % were Anencephaly, 26.92% were Spina bifida, 20.19% were anencephaly +spina bifida and 5.77%were Encephalocele.

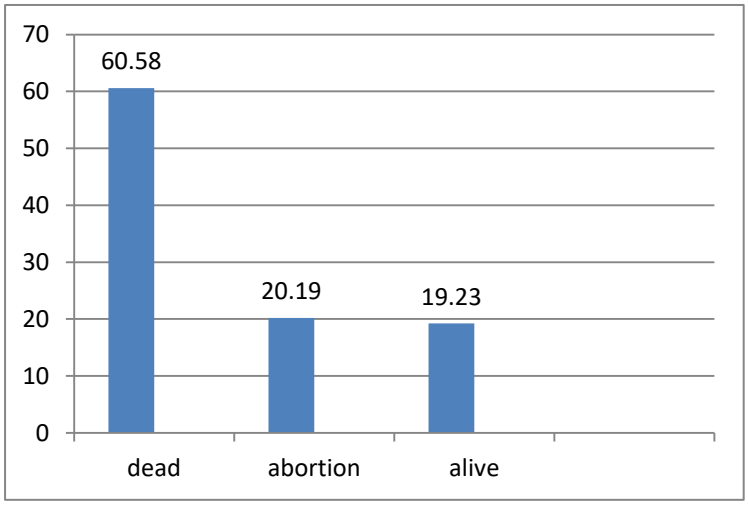


Figure5.2 Outcome of NTDs in percent

Out of 104 NTDs 60.58% were dead, 20.19% were abortion and 19.23% were alive .Out of alive cases most of them were spina bifida cases.

Out of medically terminated cases, stillbirth, aborted and live births, the total prevalence of neural tube defect (NTDs) was 13.8(95% CI, 13-14.49) / 1000 deliveries .From 104 cases, 49/ 7500 were Anencephaly, 28 /7500 spinal bifida, and 21/7500 both Spina bifida and anencephaly and Encephalocele 6/ 7500. The prevalence of each NTDs was, Anencephaly was 6.5(95% CI, 5.8-7.2) / 1000 deliveries, Spina bifida 3.7(95% CI, 3.01-4.39) / 1000 deliveries, Spina bifida and Anencephaly 2.8(95% CI, 2.11-3.5) / 1000 deliveries and Encephalocele 0.8(95% CI, 0.11-1.5) /1000 deliveries. Most of Anencephaly cases were aborted or stillbirths, whereas Spina bifida cases were more likely to be live born (60% dead and 20 % alive).

Outcome	Abortion	Alive	Dead
Anencephaly	15	0	34
Spina bifida	3	19	6
Anencephaly+spina bifida	3	0	18
Encephalocele	0	1	5

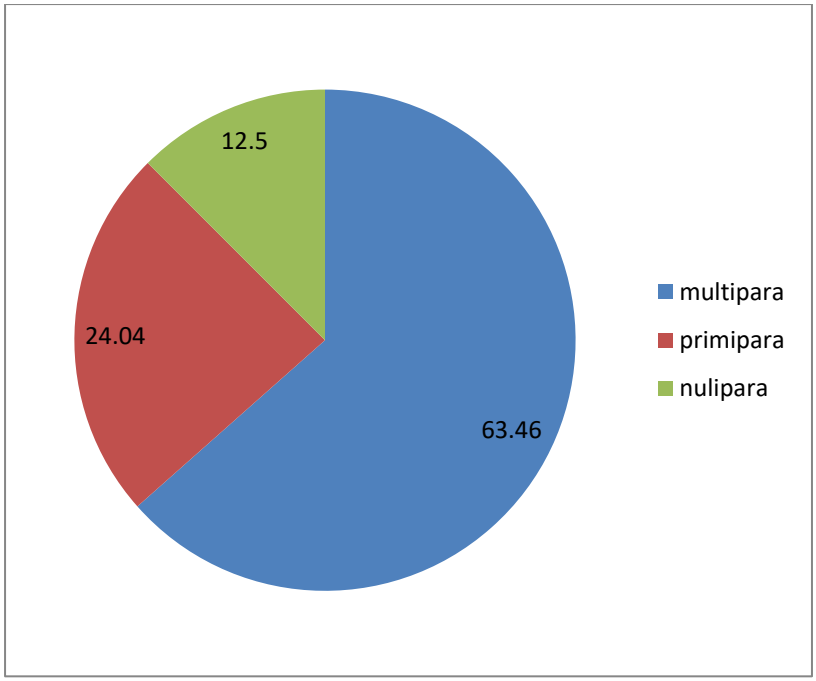
Table5.1 Frequency and outcome of each NTDs

From 104 NTDs case, 85.6% (89/104) had no ANC follow up and 90.4% (94/104) had not taken folic acid prior to conception or after conception. Preconception refers at least 3months prior to conception.

Parity	Frequency	Percent
Nuli Para	13	12.5%
Primi Para	25	24%
Multi Para	66	63.5%

Table 5.2 Frequency and Percent of NTDs based on parity

Multiparous and Primi Para were the commonest gravidities, each accounting for 63.5% (66/104) and 24 % (25/104), respectively.



Fgure5.3 percent of NTDs based on parity

Most of NTDs, 47.1% (49/104), 31.7% (33/104) and 21.2% (22/104) gestational age were 37–40 weeks, 28–36 weeks and <28 weeks, respectively.

Neural tube defect (NTDs) on the basis of gender, 54.8%(57/104) anencephaly were females, whereas 45.2% (47/104) Spina bifida were males. Out of 104 NTDs 84.6% from Addis Ababa.

		neural tube defect				Total
		anence+spina	Anencephaly	Encephalocele	spina bifida	
Gender	Male	9	23	2	13	47
	Female	12	26	4	15	57
Total		21	49	6	28	104

Table 5.3 Types of NTDs and Genders [N =104].

Out of 104 NTDs 57 were female sex which accounts 54.8% and 47 were male sex which accounts 45.2%.

Table5.4 Abi-variable and multivariable logistic regression results on factor associated with NTDs

Variable	Category	COR(95%CI)		AOR(95%CI)	
Folic acid use	Yes	0.454(0.222 -0.925)		2.205(1.008-4.498)	
	No	1		1	
Preconception care	Yes	0.960(0.255-3.617)		0.455(0.130-1.584)	
	No	1		1	
Medical complication	Yes	1		1	
	No	0.355(0.116-0.971)		2.985(1.030-8.655)	
ANC follow up	Yes	0.688(0.372-1.276)		0.862(0.448-1.658)	
	No	1		1	
Sex	Male	1.008(0.644-1.578)		1.697(1.011-2.848)	
	Female	1		1	

NB- COR= Crude odd ratio, AOR= Adjusted odd ratio, CI= Confidence interval

Those who took folic acid in the first trimester of pregnancy had reduced risk of giving birth of NTDs by 2.2times. (AOR: 2.205, 95% CI, 1.008-4.498) and those who did not have medical complication during pregnancy reduced risk of NTDs by 3times from those who had medical complication.(AOR:2.985,95%CI,1.030-8.655).

6. Discussion

Hospital based retrospective cross sectional study was conducted in this study. The study consists of reviewing 7500 delivery logbook and charts. Among 7500 104 deliveries were NTDs.

In this research, the overall prevalence of NTDs was found to be 13.8(95% CI, 13-14.49) per 1000 pregnancies, which had similar outcome in a study done in Debre Berhan Referral

Hospital 10.9(95% CI, 8.9-13.3) per 1000pregnancy and study done in Northern Ethiopia Tigray region 13.1 per 1000 pregnancy. This may be due to both of them wesre done in a single referral hospital.

The outcome of this study was ten times more prevalent than a research done in Europe countries 0.9/1000{Joan .K. Morris et al. 2021}. This may be due to food fortification with folic acid in Europe and 2.5 times more prevalent than a systematic review and met- analysis done in Africa 50.71/10000{Daniel Atlaw et al. 2021}, Four times more prevalent than a systematic review and meta-analysis done in East Africa 33/10000{Paddy sentongo et al 2022} and which may be due to less sample size, single hospital study with short duration

Two times more prevalent than a systematic cross-sectional analysis and meta-analysis done in Ethiopia 63.3/10000{Zebenay Workneh Bitew et al .2020}, 1.2times more prevalent than a study done at three teaching hospitals in Addis Ababa, Ethiopia,126/10000{Abel Gedefaw et al. 2018}. This may be as a result of less sample size, short duration and study was done in a single referral hospital.

NTDs were observed to occur slightly predominant in females sex (54.8%) and male (45.4%) which had similar outcome with a case control study done in Amhara region{Abay Woday Tadesse et al. 2020}. but still anencephaly cases were the common neural tube defect (47.12 %) followed by spina bifida(26.92%). In this research, the high rate of NTDs may be as a result of lack of routine folic acid supplementation and absence of food fortification with folic acid .Over 90.4% of the cases did not receive periconceptional folic acid supllementation, and 85.6% did not undergo ANC follow-up. or started follow up before 3month of pregnancy which had similar findings done in Addis Ababa {Abel Gedefaw et al. 2018} and Tigray {Birhane et al. 2018} 92.2% and 85.3% case of mothers, did not take folic acid respectively. Multiparas were the most common 63.5% followed by primiparas 24% and 3.85% of cases were having medical complication. Considering the age, 49% of the cases were between 18-35 years of age and 37.5% were age above 35 years.

Pregnant individuals who consumed folic acid in the initial trimester experienced a 2.2 fold decrease in the likelihood of delivering infant with NTDs (AOR: 2.205, 95% CI, 1.008-4.498) and those who did not have medical complication during pregnancy reduced risk of NTDs by 3times from those who had medical complication.(AOR:2.985,95%CI,1.030-8.655). The finding was supported by a study done in case controls study in governmental hospital in Amhara region (Abay Woday Tadesse et al. 2020).

Conclusion

The prevalence of neural tube defect (NTDs) in this research was among the highest globally reported (Africa, Europe, America, as well as reported from Ethiopia). The most common and prevalent neural tube defect in this research was Anencephaly followed by Spina bifida. Enhance periconceptional folic acid use, counseling ANC follow-up, and for women with certain medical illness at higher risk for neural tube defect (NTDs), food fortification with folic acid are possible approach to reduce NTDs.

Recommendation

- Since this was hospital-based study with a small sample size and short duration, a larger study recruiting more patients with a longer duration of follow-up at the national level are needed for further identification of associated factors
- Furthermore prospective study will be better to dig out more associated factors
- Food fortification with folic acid should be incorporated to guidelines by ministry of health
- Increases awareness on preconception care and folic acid use

Limitations of the study

- Short duration of study
- Data's were not fully registered or documented in delivery log book and patient charts
- Genetic mutations are associated with NTDs and unable to screen such genes.
- Unable to include congenital defect before 12weeks of gestation
- Convenience sampling technique.

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7. Appendix A

Title of research: birth prevalence of neural tube defect (NTDs) and associated factors

Principal investigator: Dr.Zelalem chanie

Advisor: Dr. Tehetena Assefa and Dr. Asegid Geleta

Name of organization: Addis Ababa University, collage of health science

Purpose of the research: The aim was to assess the prevalence of neural tube defect and associated factor at alert hospital

Benefit: The result would serve as input for other researchers on NTD and also used for MOH as input for policy making for the intervention of NTD which is one of the most common problem but also preventable

Appendix B

Chart and Logbook check list form

MRN

Part I. Socio-demographic variables

No	Question	Response	Code
1	Age	1. <18 2. 18-35 3. >35	
2	Marital status	1. Married 2. Separated 3. Single	

3	Address	1. Addis Ababa 2. Oromia 3. Other	
4	Religion	1. Orthodox 2. Muslim 3. Other	
5	Educational status	1. Can't read 2. Can read and write 3. Primary 4. Secondary and above	
6	Occupation	1. Employed 2. Merchant 3. Farmer 4. Daily laborer 5. Student 6. House wife 7. Others	
7	Parity	1. Nuli para 2. Primi para 3. multi para	
8	Pregnancy type	1. Planed 2. Unplanned	
9	ANC follow up before 4month of pregnancy	1. Yes 2. No	
10	Folic acid supplementation	1.yes 2. No	
11	Preconception care before conception	1.Yes 2. No	

12	Neural tube defect	1. Yes 2. No	
13	If yes type of NTD	1.Anencephaly 2. Spina bifida 3. Anencephaly +spina bifida 4. Encephalocele	
14	Prior history of NTD	1.Yes 2. No	
15	Gestational age	1. <28week 2. 28-36 week 3. >37week	
16	Outcome	1. Alive 2. Abortion 3. Dead	
17	Sex of neonate	1. male 2. Female	
18	Family history of NTD	1. Yes 2. No	
19	Comorbid illness	1.Yes 2. No	
20	If yes	1. DM 2. CKD 3. CLD 4. Epilepsy 5. others	
21	History of substance abuse	1. Yes 2. No	
22	Alcohol use	1. Yes 2. No	

23	Medication use	1. Yes 2. No	
24	Chemical or radiation exposure	1. Yes 2. No	