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RESEARCH ARTICLE

Incidence of Neural Tube Defects in Al-Kadhimyia Teaching Hospital

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Abstract

Neural Tube Defects (NTDs) including spina bifida ,anencephaly and encephalocele are the second most prevalent congenital anomaly , second only to cardiac malformations, and they are associated with substantial morbidity and mortality with multifactorial etiology ,and with great variation in their incidence in different population .

Objective

To estimate the incidence of Neural Tube Defects and to identify some of the possible risk factors for their occurrence.

Methods

A prospective study was carried out in the maternity ward at Al-Kadhimyia Teaching Hospital from the first of August 2009 to the end of july 2011. All live births newborns were included in the study and assessed for the presence of Neural tube defects .The demographic characteristics and general information of the neonates and their mothers were collected by direct interview of mothers using special questionnaire .

Result

During the study period ,the total number of live births was 18344, of these ,62 had Neural tube defects giving an overall incidence of 3.37 /1000 live births.The rate of Neural Tube Defects was higher in males than females (p-0.01).Spina bifida was the most common type among the affected cases (92 %) and the corresponding incidence was 3.2/1000 live births .The birth incidence was higher in January –June period (p- 0.0001) .Residence in rural areas (p-0.0001) , consanguinity marriage (P-value 0.001),low maternal education (P-value 0.005),multiparity unbooked mothers (p-0.006) and negative history of folate consumption (p-0.001)are important risk factors for Neural tube defects)p-001) .

Conclusion

The incidence of Neural Tube Defects is high in comparision with developed and some developing countries .Imlementation of strategies to decrease the rate of these anomalies would be beneficial to prevent them Fortification and supplementation of folic acid and prenatal screening could decrease Neural tube defects and other devastating conditions .

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Background

Introduction

Neural tube defects (NTDs)are congenital structural abnormalities of the brain and vertebral column that occur either as an isolated malformation ,along with other malformation ,or as part of genetic syndrome and the second most common major congenital anomaly after cardiac malformation(1). Despite the considerable progress that has been made towards understanding Neural tube defects ,they remain among the most common serious birth defects ,and the etiology of most causes is still unknown .It is accepted that there is a genetic-environmental intervention in the causation 0f NTDs (2,3). Nutritional factors such as diet and vitamins appear to be important contributors to the etiology of NTDs (3).The incidence of NTDs varies widely according to geographical distribution ,ethnic back ground ,maternal and various socio-economic factors (4,5) .It ranges from as high as 1/100 live births in some regions of china to about 1/1000 or less in many countries (6-11).Since NTDs often result in fetal death ,neonatal and infant death ,and developmental disabilities among surviving infants and children(12).prevention could be an important strategy to relief NTDs burden. Neural Tube Defects are among the few birth defects for which primary prevention is possible, prenatal screening and diagnosis are widely available, and prenatal therapy is being investigated (1,13).In view of the significant health costs of NTDs, it is important to have baseline data of the incidence of NTDs in every region. This study was carried out to determine the current incidence of NTDs among neonates delivered at AL-kadthimyia Teaching Hospital over a period of two years ,(2009-2011).

Patients and methods.

AL-Kathimyia Teaching Hospital is a large public hospital in the north of Baghdad,Iraq. It serves population of about one million and the maternity care unit receives about 700-800 deliveries monthly .All live born babies ,both term and preterm, over the 2-years period from the 1st of august 2009 to the end of July 2011 were included in the study and were assessed for the presence of NTDs. Stillborn babies were excluded.

Demographic characteristics and general information of the neonates and their mothers ,sex ,presence of NTDs ,season ,its type ,mother age , parity ,residence ,consanguinity marriage ,maternal education ,family history of NTDs and folic acid intake during pregnancy were collected by direct inter view of the mothers using special questionnaire form .All affected babies were examined for their gestational age, birth weight, type of NTDs,sites, and associated congenital anomalies. After collection, the data were entered into the computr,and analyzed using the SPSS PC software. Chi-square test was used when appropriate. A p value was considerd significant if it was less than 0.05 .

Results

The total number of live births during the study period was 18344.Of these 62 had NTDs giving an incidence of 3.37/ 1000 live births and the yearly incidence was 3.38/1000 and 3.37 /1000 live births which was not significant (P- value 0.99)as shown in table (1) .Regarding the sex of NTDs cases ,38 were males and 24 females ,the rate of NTDSs was 4.5 /1000 births and 2.4 in males and females respectively which was statistically significant (P-value 0.01) as shown in table (2) .Out of the 62 NTD cases ,57 (92 %) had spina bifida (meningomyelocele and meningocele),3(4.8%) encephalocle and 2 cases (3.2 %)had anencephaly as shown in table (3). The corresponding incidence for spina bifida was 3.10 /1000 live births, for encephalocele 0.16 /1000 and 0.11 /1000live births for anencephaly . Seasonal variations during the study period show higher rate of NTDs in January-June period compared to July-December period(P-value 0.00001)as shown in table(4) .the peak incidence occurred in April .

Table(5) shows the rate of NTDs with certain maternal characteristics .There was no significant association between the rate of NTDs and maternal age (P-value 0.99) . On the other hand there was a significant association with other maternal variables like residence (P-value 0.00001) , consanguinity marriage (P-value 0.001),maternal education(P-value 0.005), parity (P-value 0.0001) , antenatal care (p-value 0.006) and folic acid supplement during pregnancy (p-value 0.001).

Table 1: Incidence of NTDs from August 2009-august 2011.

year	Total number of Live births	Neural of NTDs	Yearly incidence / 1000 live birth	P-value
2009-2010	8280	28	3.38	0.99
2010-2011	10064	34	3.37	
Total	18344	62	3.37	

Table 2 :Incidence of NTDs by gender .

Gender	Total No. of live birth	Number of NTDs	Incidence /1000 Live birth	P-value
Male	8420	38	4.5	0.01
Female	9924	24	2.4	
Total	18344	62	3.37	

Table 3:Incidence of NTDs by type of defects.

Type of defects	No.	Percentage %	Incidence/1000 Live birth
Spina bifida	57	92	3.10
Encephalocele	3	4.8	0.16
Anencephaly	2	3.2	0.11
Total	62	100	3.37

Table 4:Incidence of NTDs by months.

Months	Total No. Of live births	Total No.of NTDs	Incidence /1000 Live biths	P-value
January,Feberuary,March	3705	25	7.3	0.0001
April, may ,June	4750	17	3.5	
July, August ,September	6213	8	1.3	
October, November, December	3676	12	3.2	
Total	18344	62	3.37	

Table 5-Incidence of NTDs according to maternal characteristics

Variable	No.of live births	N0.of NTDs	Incidence of NTDs / 1000 live births	P-value
Age(years)				
≤ 20	1982	6	3.02	
21-25	3966	13	3.27	
26-29	5453	18	3.30	0.99
30-34	3472	13	3.74	
≥ 35	3471	12	3.45	
Total	18344	62	3.37	
Residence				
Rural	6339	40	6.31	0.00001
Urban	12005	22	1.83	
Consanquinity				
Yes	9005	43	4.77	0.001
No	9339	19	2.03	
Education				
≤primary school	10334	45	4.35	0.005
>primary school	8010	17	2.12	
Parity				
Primigravida	6921	12	1.73	0.0001
Multigravida	11423	50	4.37	
Ante-natal care				
Booked	7901	16	2.02	0.006
unbooked	10443	46	4.40	
Folic acid intake during pregnancy				0.001
Yes	9570	21	2.19	
No.	8774	41	4.67	

Discussion

The overall incidence of NTDs is declining worldwide due to improved nutrition and widespread prenatal diagnosis with subsequent elective termination of the pregnancy (1-2,8) .In this study neither of these measures were applied and the overall incidence during the study period was 3.37 /1000 live births,which is higher than other countries such as United state of America where it was less than 0.5 /1000 live births (2), in Al-Kuwite 1.6 /1000 live births (14),in United Arab Emirates1.23 /1000 live births (15) and Saudi Arabia 0.7 /1000 live births (9) .A higher incidence in comparison with other results was observed in china 1/100 live births (6) ,in India 6.57-8.21 (7) and Jordan 6.5 /1000 live births (16).These variations in different studies could be explained by the influence of racial ,ethnic and social factors in various parts of the world or different geographical ,nutritional and socioeconomic factors. Other reasons for these variations are the type of sample and method of diagnosis. Regarding sex differences ,this study indicate that the rate of NTDs was higher in male than female which is in agreement with other reports(9,17).Many studies observed a significant females predominate (18,19 ,20).These variations appear to be influenced by the presence of additional birth defects,geographical area and other factors(17).Spina bifida was the most common NTDs in our study, which agree with other studies (9,16,17).Other studies showed that anencephaly was the common NTDs (20,21).

In this study a seasonal variation was observed and the rate of NTDs was higher in January-June period compared with July-December which is similar to that reported by McDonnell etal (22).Spina bifida and anencephaly tend to occur more frequently in spring conceptions (23).This is especially true in areas where the risk is high, however most American studies failed to demonstrate such variation (3).The seasonal variation in the birth incidence and peak of NTDs observed in our population were difficult to compare with those of previous studies ,which were performed in countries where income ,season , changes in diet is completely different. The present study showed no significant association between the incidence of NTDs and maternal age ,this observation was different from other

studies that showed higher rate among young mothers (≤ 20 years) and those over 35 years (22,24).Thus age is a complex risk factor inNTDs and this issue needs more investigation. A high incidence of NTDs at birth has been shown for rural areas compared with urban areas (6, 25)which is similar to the results of our study . It may be due to factors such as high population growth rates and socioeconomic factors.It has been shown that the rate of consanguineous marriage is higher in NTD births (26) .In families with children born with NTDs,the consanguinity rate was much higher than that observed in the general population (27,28) which is in agreement with the result of this study .The possibility that consanguinity could be a risk factor for NTDs in population requires further research (26).Regarding maternal education, the risk for NTDs was seen inversely related to the level of maternal education, with women who had primary school or less ,having more 2-fold risk of developing NTD births when compared to those with higher education (29,30) . This is consistent with our study, which showed a significant association of low education with NTDs.

Concerning parity the study showed an association of NTDs with increasing parity which is in similarity with that studies (16,19 ,24).

In this study ,all mothers with affected newborns had ultrasound scans during pregnancy but the NTDs had not detected in most cases ,which may indicate a misuse of ante-natal ultrasound scanning by inexperienced practitioners .only 12 out of 62 NTD cases were prenatally diagnosed by ultrasound examination ,but the low in Iraq does not allow termination of pregnancy for congenital anomalies .

Randomized trials have consistently shown that folic acid supplementation markedly reduces the incidence 0f NTDs (32-34) .Because neural tube development occurs within the first four weeks of embryonic life (i.e by six weeks of gestation)and before many women know they are pregnant or meet a clinician ,folic acid supplementation should be started at least one month prior to conception and continue throughout the first trimester. Further more ,because many pregnancy are unplanned, folic acid supplementation is recommended for all women of childbearing potential (35) Preconception folic acid supplementation reduce the incidence of NTDs by 50-70 % (2,13) . In this study negative history of maternal folate consumption was the most important risk factor for NTDs and only 21 (33.8 %)of the mother with affected newborns non of them received it during pregnancy .

In conclusion ,NTDs are among the most common congenital anomalies that we encountered and spina bifida was the most common type of NTDs.Males,seasonal variations ,residence in rural area, consanguinity marriage ,low maternal education and negative history of folate consumption are important contributor to NTDs .Programs should be implemented to educate physician ,other health professionals, and the public about the value of folic acid in preventing NTDs.It is also recommended that pregnant women should be offered prenatal screening or diagnostic testing to identify fetal abnormalities .

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