ARAŞTIRMA MAKALESİ / *RESEARCH ARTICLE*

Comorbid Conditions in Newborn Operated Due to Open Spinal Dysraphism and Retrospective Evaluation of Relation Between These Situations with Folic Acid Usage During the Pregnancy

Açık Spinal Disrafizm Nedeniyle Opere Olan Yenidoğanlarda Komorbid Durumlar ve Bunların Gebelikte Folik Asit Kullanımıyla İlişkisinin Retrospektif İncelenmesi

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ABSTRACT

Aim: *In the present study, we aimed to analyze comorbid conditions associated with operated myelomeningocele and their relationship with folic acid usage during pregnancy.*

Material and Method: *Eighty-one newborns who were operated on due to myelomeningocele were included in this study. The patient's files were retrospectively reviewed, and the data of the patients were recorded. The patients were divided into two groups: folic acid users and non-folic acid users during pregnancy. The two groups were compared in terms of weight, height, hemogram, biochemistry, time of diagnosis, delivery method, maturity, localization, type (meningocel or myelomeningocel), neurological deficit, scoliosis, hydrocephalus, timing of surgery, ventriculomegaly, treatment method, additional pathology, tethered cord syndrome, dermal sinus, maternal disease, and number of malformations such as cerebrospinal fluid fistula.*

Results: *The rate of folic acid usage during the antenatal period was 44.4%. Myelomeningocele was located in lumbar (40.7%) and sacral (46.9%) regions. The rate of operation with early diagnosis newborn (1<week) was high (60.5%). There was no significant relationship between the timing of surgery and complications. Hydrocephalus (55.0%), ventriculomegaly (61.7%), scoliosis (34.6%), cerebrospinal fluid fistula (4.9%), and dermal sinus (46.9%) accompanied anomalies. Comparing the folic acid group with the non-folic acid group, it was revealed that the rates of cesarean delivery (75% ; p=0.017), meningomyelocele (80% ; p<0.01), paraparesis (39.5% ; p=0.006), paraplegia (16% ; p=0.006), and dermal sinus (53.1% ; p=0.022) were significantly higher in the non-folic acid group, whereas the mean birth weight was significantly lower (p=0.04) in the non-folic acid group.*

Conclusion: *In our study, folic acid usage during pregnancy results in higher birth weight, higher number of normal births, and lower rates of myelomeningocele, paraplegia, and paraparesis but a higher rate of dermal sinus in newborn who have been operated for meningocele or myelomeningocele. Therefore, we recommend folic acid usage during pregnancy.*

Key words: *open spinal disraphism; myelomeningocele; meningocele; folic acid; pregnancy*

ÖZET

Amaç: *Biz bu çalışmada, opere edilen meningosel ve miyelomeningosel olgularına eşlik eden komorbid durumları ve bunların gebelikte kullanılan folik asitle ilişkisini incelemeyi amaçladık.*

Materyal ve Metot: *Meningosel ve myelomeningosel tanısıyla opere edilen 81 yenidoğan bu çalışmaya dahil edildi. Hasta dosyaları retrospektif olarak taranarak olguların veriler kaydedildi. Olgular, gebelik döneminde folik asit kullanan ve kullanmayan grup olarak ikiye ayrıldı. İki grup arasında yenidoğanların ağırlık, boy, hemogram, biyokimya, tanı zamanı, doğum şekli, maturite, lokalizasyon, tip, nörolojik defisit, skolyoz, hidrosefali, cerrahi zamanı, ventrikülomegali, tedavi şekli, ek patoloji, tetheredcord sendromu, dermal sinüs traktı, maternal hastalık birlikteliği ve BOS fistülü gibi malformasyonların sayısı, karşılaştırıldı.*

Bulgular: *Antenatal dönemde folik asit kullanımı %44,4 olarak saptandı. Meningomiyelosel %40,7 lomber, ve %46,9 sakral bölgedeydi. Erken tanılı yenidoğanlarda (<1 hafta) operasyon oranı daha (%60,5) yüksekti. Cerrahi zamanlama ile komplikasyonlar arasında anlamlı bir ilişki yoktu. Hidrosefali (%55,0), ventrikülomegali (%61,7), skolyoz (%34,6), BOS fistülü (%4,9) ve dermal sinüs traktı (%46,9) eşlik eden ek anomalilerdi. Folik asit kullanılan ve kullanılmayan gruplar karşılaştırıldığında, folik asit kullanılmayan grupta sezaryenle doğum oranı (%75) (p=0,017), myelomeningosel oranı (%80) (p<0,01), paraparezi %39,5 ve parapleji %16 (p=0,006) anlamlı derecede yüksek, dermal sinüs traktı (%35,6) (p=0,022) ve ortalama doğum ağırlığı ise anlamlı derecede düşük (p=0,04) saptandı.*

Sonuç: *Bizim yaptığımız bu retrospektif çalışmada, meningosel ve miyelomeningosel tanısıyla opere olan yenidoğanlarda gebelik döneminde folik asit kullanımı daha yüksek doğum ağırlığı ve daha yüksek oranda normal doğumla birliktelik göstermekte, daha az oranda miyelomeningosel, parapleji ve paraparezi̇ye neden olmakta ancak folik asit kullanımı daha yüksek oranda dermal sinüs traktına neden olmaktadır, bu bilgiler doğrultusunda gebelik döneminde folik asit kullanımını önermekteyiz.*

Anahtar kelimeler: *açık spinal disrafizm; miyelomeningosel; meningosel; folik asit; gebelik*

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Introduction

Open spinal dysraphismes (OSD) are the most common congenital malformations of the central nervous system (CNS) and develop due to the late closure or failed closure of neural tubes during the first month of pregnancy. A myelomeningocele and meningocele as OSD may be accompanied by anomalies such as hydrocephalus, scoliosis, tethered cord, neurological deficit, ventriculomegaly, dermal sinus tract and CSF fistula. Although the predisposing factors for OSD are not precisely known, hyperthermia, drugs (e.g., valproic acid), folic acid deficiency, various chemical compounds, malnutrition, maternal obesity or diabetes, and genetic anomalies in the folic acid pathway are associated with the development of OSD[1]. The incidence of OSD varies by race, ethnicity, geographical region, and socioeconomic status and the incidence of OSD has been reported to be 11.7/10.000 in Africa, 9/10.000 in Europe, and 3.3/10.000 in the US[2,3]. OSD can be prevented by folic acid usage during pregnancy[4]. Based on the results of observational studies, the US Public Health Service (1992) recommends that all women of childbearing age should take folic acid or women planning to become pregnant should consume 400 mcg of folic acid daily, provided that they begin to use it 3 months before pregnancy and continue during the first three months of pregnancy[4]. In most studies in the literature, the effect of folic acid usage on the development of OSD has been investigated[4].

We retrospectively aimed to investigate the effect of folic acid usage on the incidence of congenital malformations such as meningocele, myelomeningocele, hydrocephalus, scoliosis, tethered cord, neurological deficit, ventriculomegaly, dermal sinus tract and CSF fistula in newborn who have been operated for meningocele or myelomeningocele.

Material and Method

After obtaining approval from the Non-Interventional Clinical Trials Ethics Committee of our hospital, the data of 81 newborns [43 female (53.19%), 38 male (46.9%)], aged 1–16 days (mean age: 7.6±2.8), who were diagnosed with meningocele and myelomeningocele (Figure 1) and operated on between January 1, 2012, and January 1, 2017, were retrospectively analyzed. The data of mathernal, including age, mather and father from same ancestor and drug abuce of mather and father were recorded. The data of newborns, including age, gender, weight, height, hemogram, biochemistry, time of diagnosis, delivery method, maturity, localization, type, neurological deficit, scoliosis, hydrocephalus, timing of surgery, ventriculomegaly, treatment method, additional pathology, maternal folic acid usage, tethered cord syndrome, dermal sinus tract (Figure 2), maternal

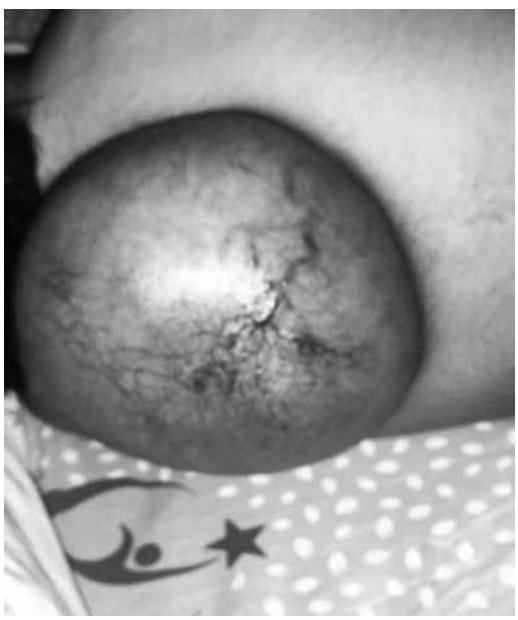

Figure 1. *Meningocele and myelomeningocele.*

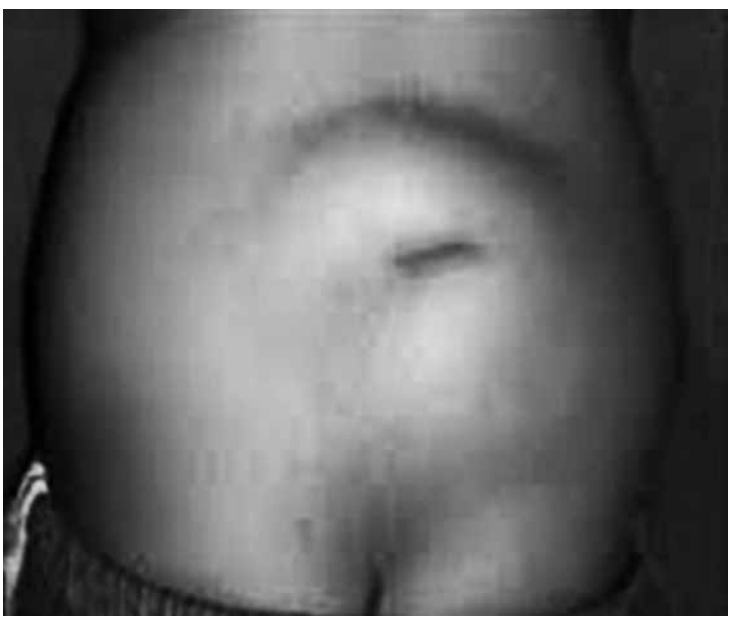

Figure 2. *Dermal sinus tract.*

disease, and cerebrospinal fluid (CSF) fistula, were recorded, and descriptive statistics of all these data are presented. The newborns were divided into two groups: those whose mothers were folic acid users and those whose mothers were folic acid non-users. Newborns' weight, height, hemogram, biochemistry, time of diagnosis, delivery method, maturity, localization, type, neurological deficit, scoliosis, hydrocephalus, timing of surgery, ventriculomegaly, treatment method, additional pathology, maternal folic acid usage, tethered cord syndrome, dermal sinus tract, and number of malformations such as CSF fistula were compared between the two groups.

Statistical analysis

Statistical analysis was performed using SPSS 21.00 for Windows. The conformity of the data to normal distribution was analyzed using Kolmogorov-Smirnov test. The comparison of data with normal distribution was performed using Student's t-test. The results are presented as mean ± SD. The comparison of categorical data was performed using chi-square test, and the results are presented as number and percentage. A P value ≤0.05 was considered statistically significant in the comparison of all data.

Results

Descriptive statistics of the patients' demographic data are presented in Table 1.

Descriptive statistics of gender, time of diagnosis, delivery method, maturity, meningocele ve miyelomeningocele localization and type, congenital anomalies associated with meningocele and myelomeningocele such as, neurological deficit, scoliosis, hydrocephalus, ventriculomegaly, tethered cord syndrome, dermal sinus tract, CSF fistula ve timing of surgery, treatment method, folic acid usage during pregnancy, additional pathology and maternal disease are presented in Table 2. Folic acid usage during pregnancy had an effect on the weight of newborns, and the weight of newborns born to mothers who consumed folic acid was significantly higher (p=0.004).

The comparison of the effect of folic acid usage during pregnancy in terms of gender, age, weight, height, cell blood count and blood biochemistry is presented in Table 3. The comparison of the effect of folic acid usage during pregnancy in terms of gender, time of diagnosis, delivery method, maturity, localization, type, neurological deficit, scoliosis, hydrocephalus, ventriculomegaly, timing of surgery, treatment method, additional pathology, tethered cord syndrome, dermal sinus tract, maternal disease, and number of CSF fistula is presented in Table 4. In the folic acid group, the number of cesarean sections was significantly lower than that in the non-folic acid group (p=0.017). The number of cases with meningocele was significantly higher in the folic acid group (p=0.001). The number of cases with myelomeningocele was significantly higher in the non-folic acid group (p=0.001). The number of cases with monoparesis was significantly higher in the folic acid group (p=0.006). The number of cases with paraparesis and paraplegia was significantly higher in the non-folic acid group (p=0.006). The number of cases with dermal sinus tract was significantly higher in the folic acid group (p=0.022).

We have performed our study with neonatals who have been operated for meningocele or myelomeningocele. Demographic data of mothers who used or did not used folic acid during the pregnancy and comparison of bearing risks related to open spinal dysraphism are given at Table 5. The ages of mothers are not shown statistically significant difference in both groups. Mothers have had no risks with regards to diabetes, smoking, high fever, usage of drugs that would reduce the folate levels and drug abuse.

Discussion

During our study, 81 neonatals who have been operated for meningocele or myelomeningocele have been evaluated, and while 45 mothers did not use folic acid during the pregnancy, 36 of mothers regularly used folic acid during their pregnancy period. By considering these parameters, we assessed the effect of folic acid usage on these parameters in neonatals who were diagnosed with meningocele or myelomeningocele. We also evaluated the ages and drug abuse habits of the mothers who used and did not use folic acid, and their relationship by affinity with the fathers of neonatals.

While information regarding how folic acid prevents the development of NTD (Neural Tube Defect) is limited, it has been detected that folic acid promotes the fast cell cycle which is highly critical for the closure of neural tube. Folates act as co-factor of enzymes that have a function in biosynthesis of DNA and RNA and intracellular reactions. Folic acid is transformed into S-adenosyl methionine as a result of series of reactions in methylation cycle, and enables usage and transfer

Table 1. *Laboratory and demographic data of cases*

Parameters	n	Minimum	Maximum	Mean	Standard deviation
Age (Day)	81	1.0	16.0	7.6	2.8
Weight (kg)	81	1.6	3.4	2.2	0.3
Height (cm)	81	46.0	53.0	50.9	1.7
RBC	81	2.1	5.9	4.8	1.0
HBG	81	7.0	20.3	15.3	4.3
HTC	81	7.8	64.0	43.5	15.7
WBC	81	9.5	22.0	15.0	3.2
NEU	81	3.1	50.1	9.1	8.4
PLT	81	155.0	553.0	321.6	115.5
MPV	81	7.8	11.6	9.2	1.0
CRP	81	1.0	19.0	3.4	4.3
Glucose	74	33.0	141.0	86.5	27.4
Creatinin	81	0.1	31.0	0.9	3.4
Total Protein	81	4.3	7.0	5.5	0.7
Direct Bilirubin	81	0.1	4.8	0.6	0.8
Total Bilirubin	81	0.1	13.3	3.8	3.4
Aspartate Aminotransferase (AST)	81	28.0	167.0	62.1	36.8
Alanine Aminotransferase (ALT)	81	6.0	87.0	29.1	19.5
γ-Glutamil transferaz (GGT)	81	5.0	312.0	107.8	87.9
Na	81	120.0	152.0	139.6	6.6
K	81	2.2	9.6	4.9	1.4
Ca	81	7.3	10.7	8.7	0.9

RBC, red blood count; HBG, hemoglobin; HTC, hematocrit; WBC, white blood cell; NEU, neutrophil; PLT, platelet; MPV, mean platelet volume; CRP, C-reactive protein.

of the only carbon group in biosynthesis of urine and pyramiding, which are the building blocks of DNA. Besides, it acts as a source of carbon for different oxidative reactions. Its primary duty is to prevent the existence of mutated genes. In addition, by providing the methyl groups to metilation cycle, it enables homocysteine to transform into methionine again[5].

There are two main hypotheses regarding the effects of folate deficiency on development of NTD. Both hypothesis put emphasis on micronutrients and genetic factors that affect the development of NTD. The first hypothesis asserts that in case of low serum folate levels, due to the limited transfer of folic acid to the embryo's cells, normal cell functions are damaged and proliferation is limited. In case of folic acid deficiency, methionine formation decreases, and intracellular S-adenosyl methionine level falls. As a result, methylation of cytosine and thymine is damaged, and that creates activation of improper protooncogens. Therefore, malignant transformation is stimulated and evaluation of mutated genes cannot be prevented. Limitation of thymidylate formation results in wrong DNA formation and stimulates the evaluation of megaloblastosis. Additionally, in case of folic acid deficiency, cells cannot move forward in metaphase and anaphase during cellular division[6].

According to the second hypothesis, in case of folic acid deficiency, plasma homocysteine level increases. Thus, homocysteine prevents the closure of neural tube by repressing the N-methyl-D-asparate receptors in neural epithelium[7].

One of the primary factors of the methylation cycle is the 5.10-methylenetetrahydrofolate reductase (MTHFR) enzyme. MTFHR acts as a catalyst for reduction of 5.10-methylenetetrahydrofolate to 5-methylenetetrahydrofolate. As an active form of folic acid, 5-methylenetetrahydrofolate methylases the homocysteine in order to transform into methionine again. MTFHR deficiency causes increase in plasma

Table 2. *Parameters of newborns*

Parameters		n	(%)
Gender	Female	43	(53.19)
	Male	38	(46.9)
Time of diagnosis	<1 week	49	(60.5)
	1 week-1 month	32	(39.5)
Delivery method	normaly	49	(60.5)
	C/S	32	(39.5)
Maturity	prematura	45	(55.6)
	term	36	(44.4)
Localization	sacral	38	(46.9)
	lumbar	33	(40.7)
	thoracic	10	(12.3)
Type	meningocele	29	(35.8)
	myelomeningocele	52	(64.2)
Neurological deficit	monoparesis	36	(44.4)
	paraparesis	32	(39.5)
	paraplegia	13	(16.0)
Scoliosis	-	53	(65.4)
	+	28	(34.6)
Hydrocephalus	-	36	(45.0)
	+	44	(55.0)
Ventriculomegaly	-	31	(38.3)
	+	50	(61.7)
Timing of surgery	<1 week	11	(13.6)
	1 week – 1 month	39	(48.1)
	1 month – 2 month	31	(38.3)
Treatment method	surgery	81	(100.0)
Additional pathology	-	2	(2.5)
	+	79	(97.5)
Folic acid usage during pregnancy	-	45	(55.6)
	+	36	(44.4)
Tethered cord syndrome	-	50	(61.7)
	+	31	(38.3)
Dermal sinus tract	-	43	(53.1)
	+	38	(46.9)
Maternal disease	-	80	(98.8)
	+	1	(1.2)
Cerebrospinal fluid (CSF) fistula	-	77	(95.1)
	+	4	(4.9)

homocysteine levels and that result in increase in cardiovascular diseases and NTD risk[8].

It has been detected that 677 C-T mutation of MTHFR gene decreases the activity of this enzyme and plays an important role in NTD formation[9].

Decrease in MTHFR activity is characterized by low plasma folate level, high plasma homocysteine level and low RCF. It has been detected that negative effects based on low MTHFR activity in mothers with 677 C-T mutation have been decreased as a result of the external application of folic acid[9].

In an animal study, the present results indicate that maternal folic acid deficiency stimulates neuronal apoptosis via miR-34a (microRNA-34a) associated with Bcl-2 (B-cell lymphoma-2) signalling in brain tissue of rat offspring. These findings provide novel insights into the mechanism of action of maternal folate deficiency in early neurogenesis[10].

Studies conducted in USA before 1998 showed that folic acid supplement had a decreasing effect on open spinal dysraphism; however this relationship has not been proven at more recent studies. This situation undermines the connection between folic acid and open spinal dysraphism[11].

However, folic acid usage in women in Ethiopia against neural tube defects is highly low and in this case, the folic acid usage should be increased[12].

A study conducted in China showed that a decrease has observed for both types of open spinal dysraphism after folic acid supplement, but the amount of this decrease was higher with neonatal girls[13].

Study of Hokkaido did not reveal any relation between serum folate level in first trimester and birth defects. They have said that potential comorbid factors had affected their results[14].

A study conducted in Japan revealed that formation of open spinal dysraphism could be reduced by folic acid usage[15].

As a result of the study conducted by Mutlu M et al., it has been shown that an important part of the NTDs could be prevented by periconceptional folic acid usage. The women in reproductive age group with high NTD risk factor should be given high dose (4 mg) of folic acid before starting planned pregnancy, and the women without NTD risk should be given 0.4 mg folic acid. This situation should be reinforced with practically applicable policies. Multidisciplinary approach is highly

Table 3. *Folic acid usage during pregnancy effects to parameters of newborn*

Folic acid usage during pregnancy		n (%)	Mean	Standard deviation	P
Age (Day)	-	45 (55.5)	7.76	3.113	
	+	36 (44.4)	7.44	2.512	0.620
Weight (kg)	-	45 (55.5)	2.14	0.28031	
	+	36 (44.4)	2.33	0.29234	0.004
Height (cm)	-	45 (55.5)	50.62	1.850	
	+	3644.4)	51.31	1.390	0.061
RBC	-	45 (55.5)	4.70	1.07347	
	+	36 (44.4)	4.8972	0.76994	0.335
HBG	-	45 (55.5)	15.2022	4.43619	
	+	36 (44.4)	15.3561	4.23474	0.874
HTC	-	45 (55.5)	43.4404	15.98771	
	+	36 (44.4)	43.6256	15.66030	0.958
WBC	-	45 (55.5)	14.91140	3.433529	
	+	36 (44.4)	15.16475	3.027160	0.725
NEU	-	45 (55.5)	10.49876	10.918576	
	+	36 (44.4)	7.36583	2.670820	0.069
PLT	-	45 (55.5)	311.13	106.865	
	+	36 (44.4)	334.64	125.712	0.375
MPV	-	45 (55.5)	9.244	1.0621	
	+	36 (44.4)	9.056	0.8279	0.371
CRP	-	45 (55.5)	3.5442	4.37299	
	+	36 (44.4)	3.2625	4.30451	0.772
Glucose	-	42 (51.8)	91.417	28.7138	
	+	32 (39.5)	79.978	24.5370	0.069
Creatinin	-	45 (55.5)	0.5022	0.17706	
	+	36 (44.4)	1.3928	5.07763	0.300
Total Protein	-	45 (55.5)	5.4213	0.58106	
	+	36 (44.4)	5.6117	0.76936	0.223
Direct Bilirubin	-	45 (55.5)	0.5511	0.66764	
	+	36 (44.4)	0.7528	0.98917	0.299
Total Bilirubin	-	45 (55.5)	3.1636	3.28475	
	+	36 (44.4)	4.6100	3.37685	0.056
Aspartate Aminotransferase (AST)	-	45 (55.5)	60.96	33.859	
	+	36 (44.4)	63.47	40.537	0.766
Alanine Aminotransferase (ALT)	-	45 (55.5)	28.29	17.536	
	+	36 (44.4)	30.03	21.898	0.700
γ-Glutamil transferaz (GGT)	-	45 (55.5)	101.84	78.389	
	+	36 (44.4)	115.19	99.221	0.512
Na	-	45 (55.5)	138.69	6.708	
	+	36 (44.4)	140.75	6.281	0.159
K	-	45 (55.5)	4.9927	1.40083	
	+	36 (44.4)	4.8347	1.47688	0.626
Ca	-	45	8.66942	0.832748	
	+	36	8.73250	0.899465	0.747

RBC, red blood count; HBG, hemoglobin; HTC, hematocrit; WBC, white blood cell; NEU, neutrophil; PLT, platelet; MPV, mean platelet volume; CRP, C-reactive protein.

Table 4. *Folic acid usage during pregnancy relationship with OSD in the newborn*

		Folic acid usage during pregnancy				P
		-		+		
		n	(%)	n	(%)	
Gender	Female	27	(60.0)	16	(44.4)	0.163
	Male	18	(40.0)	20	(55.6)	
Time of diagnosis	<1 week	31	(68.9)	18	(50.0)	0.184
	1 week-1 month	14	(31.1)	18	(50.0)	
Delivery method	normaly	22	(48.9)	27	(75.0)	0.017
	C/S	23	(51.1)	9	(25.0)	
Maturity	premature	26	(57.8)	19	(52.8)	0.653
	term	19	(42.2)	17	(47.2)	
Localization	sacral	25	(55.6)	13	(36.1)	0.196
	lumbar	16	(35.6)	17	(47.2)	
	thoracic	4	(8.9)	6	(16.7)	
Type	meningocele	9	(20.0)	20	(55.6)	0.001
	myelomeningocele	36	(80.0)	16	(44.4)	
Neurological deficit	monoparesis	13	(28.9)	23	(63.9)	0.006
	paraparesis	22	(48.9)	10	(27.8)	
	paraplegia	10	(22.2)	3	(8.3)	
Scoliosis	-	26	(57.8)	27	(75.0)	0.105
	+	19	(42.2)	9	(25.0)	
Hydrocephalus	-	24	(54.5)	12	(33.3)	0.058
	+	20	(45,) 5	24	(66.7)	
Ventriculomegaly	-	17	(37,) 8	14	(38.9)	0.919
	+	28	(62.2)	22	(61.1)	
Timing of surgery	<1 week	3	(6.7)	8	(22.2)	0.094
	1 week-1 month	25	(55.6)	14	(38.9)	
	1 month-2 month	17	(37,) 8	14	(38.99)	
Treatment method	surgery	45	(100)	36	(100.09	
Additional pathology	-	2	(4.4)	0	(0.09)	0.2
	+	43	(95.6)	36	(100.0)	
Tethered cord syndrome	-	29	(64.4)	21	(58.3)	0.574
	+	16	(35.6)	15	(41.7)	
Dermal sinus tract	-	29	(64.4)	14	(38.9)	0.022
	+	16	(35.6)	22	(61.1)	
Maternal disease	yok	44	(97.8)	36	(100.0)	0.368
	var	1	(2.2)	0	(0.0)	
Cerebrospinal fluid (CSF) fistula	-	41	(91.1)	36	(100)	0.067
	+	4	(8.9)	0	(0.0)	

Table 5. *Demographic data of mothers (mean ± SD and n, %)*

	Age (Year)	Smoking	Drug abuce	High fever (°C)
Folic acit usage	33±9.12	0%	0%	36.3±1.13
Non folic acit usage	31±8.23	0%	0%	36.56±1.56
p	0.548	1	1	0.123

important for early solution and observance of neonatals who were born with NTD. Early operation can reduce the frequency of other problems, especially infection[16].

One study suggests that folate levels of pregnant women at their third trimester determine the approximate value of weight of neonatals. However, it has been concluded that this result should be confirmed by more comprehensive studies[17].

Wani MA said that folic acid usage may prevent the neural tube defects[18].

Another study revealed that myelomeningocele, which emerges as a result of having arsenic contaminated drinking water could be prevented via folic acid usage at third trimester of pregnancy[19].

In the present study, correlation was found between the folic acit usage and delivery method. Contrary to the literature, the rate of vaginal delivery in the present study was found to be 60.5% (n=49) in the folic acit usage group[20–22]. Consistent with the literature, the lumbosacral region was found to be the most common location for meningocele and myelomeningocele (87.6%)[23]. In terms of gender distribution, meningocele and myelomeningocele were found to be more common in females (n=43; 53.19%), which is consistent with the literature[24]. Reportedly, folic acid deficiency is a significant risk factor for the development of OSD[25]. Patients with any disease (patients with OSD) satisfy this need by consuming drugs or food supplements[26].

In our study, there was no statistically significant difference between mother who folic acit usage with mother who non folic acit usage in terms of age, drug abuce and consanguineous marriage. Therefore, there has been a decrease in the number of cases with OSD in developed countries[27]. Meningocele (n=9; 20%) was less common in newborns of mothers who did not use folic acid than in newborns of mothers who used folic acid, whereas myelomeningocele (n=36; 80%) was more common in newborns of mothers who did not use folic acid (p=0.001).

In patients with myelomeningocele whose mothers did not take folic acid, the incidence of congenital scoliosis and ventriculomegaly was found to be 42.2% and 62.2%, respectively, a finding consistent with the findings reported in the literature[28]. Another common anomaly in these infants with OSD is urinary system anomaly[29,30]. Vesicoureteral reflux (VUR) occurs in 3%-5% of newborns with OSD, and if newborns with OCD not treated, the risk of detecting VUR at the age of 5 years is increased to 30%-40%. Therefore, the urinary systems of all patients with myelomeningocele should be evaluated by ultrasonography[30,31]. It was observed in the literature that 70%-91% of newborns diagnosed with myelomeningocele are operated on within the first 72 hours of life[6,16,17]. In the study by Bulbul et al.[6], it was found that the length of hospital stay and the rate of CNS infections were significantly lower in newborns operated on due to myelomeningocele within the first 3 days of life. In the study by Rodrigues et al.[32], the risk of developing CNS infections was found to be 5.72-fold lower in newborns operated on within the first 48 hours. In our study, 62.65% of patients were operated on within the first month of life, and this rate is consistent with that observed in the literature[21,32].

In conclusion, we found that failure to use folic acid during pregnancy had an impact on the delivery method in newborns and that the rate of vaginal delivery is significantly higher in folic acid users than in non-folic acid users (p=0.017). The number of cases with myelomeningocele was significantly higher in the non-folic acid group than in the folic acid group (p=0.001). The number of cases with monoparesis was significantly higher in the folic acid group (p=0.006). The number of cases with paraparesis and paraplegia was significantly higher in the non-folic acid group (p=0.006). The number of cases with dermal sinus tract was significantly higher in the folic acid group than in the non-folic acid group (p=0.022). Based on these findings, we can conclude that OSD are common in Turkey due to nutritional problems and drug intake. Preventive medicine should become widespread in countries such as Turkey. In addition, physicians in the preventive medicine field should provide folic acid supplements, and awareness of folic acid supplementation for pregnant women should be increased.

Limitation

Our study is retrospective and the amount of included patients is limited. We could not reach all the risk factors for open spinal dysraphism through the files of mothers. All these factors might influence our results. For the future, randomized, controlled, double blinded, prospective studies can be planned.

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