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Original Article

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Association between screen time and developmental screening test performance in children under the age of five

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ABSTRACT

Aims: Excessive screen time has been linked to delays in development, but it is not clear whether it predicts lower performance scores or affects challenging behavior in children. The study aims to evaluate the correlation between screen time and child development in children aged 6-60 months.

Methods: The study conducted in Turkiye, involving 230 mothers and children aged 0 and 60 months, assessed screen-time behavior and developmental outcomes using the questionnaire, and the Denver Developmental Screening Test-II (DDST-II).

Results: The DDST-II test of 155 (67.4%) of the children was evaluated as normal, 42 (18.2%) as abnormal, and 33 (14.6%) as uncertain. The mean age of those whose DDST-II was abnormal was 46±12.3 months. Children exposed to screens for over an hour had abnormal DDST-II results compared to those exposed for less than an hour More than 3 hours screen exposure were associated with a higher rate of abnormal DDST-II results DDST-II results were significantly associated with parental control over screen exposure.

Conclusion: A positive relationship between screen time and developmental delay in children, emphasizing the significance of effective family media strategies and screen control.

Keywords: Children, developmental delay, screen time, screen exposure

INTRODUCTION

Developmental delay (DD) is defined as disruptions in language, motor, social, and cognitive development, which affects 10-15% of all children worldwide.[1] Early detection and referring to pediatrics are essential. Developmental tests distinguish abnormal and normal children who achieve developmental abilities at a slower rate. They should be trustworthy, easy to use, specific, sensitive, and inexpensive.

Denver Developmental Screening Test-II (DDST-II) is a method to identify delays in development in children from birth to six years. It organized into four main groups: gross motor, fine motor-adaptive, language, and personal-social. The tool classifies children into three categories: normal, abnormal, and questionable. Adaptation and standardization on Turkish children were conducted by Anlar.[2] The tool has high test-retest reliability and a Cronbach's α coefficient of 0.95-0.96.[3]

Initial childhood experiences affect a child's developmental learning capacity. One in every four children shows DD by school age, causing inadequate preparation for learning and academic success. Factors like pre-term birth and low birth weight were generally associated with DD in previous researchs.[4]

There are several reports and findings about the effect of gender, race, geographic location, parental educational level on the DD in literature.[5] There is no consensus on the effectiveness of certain factors on DD, as they are found in various studies.[5]

Digital media exposure and screen time may exacerbate disparities in early child development and is rapidly changing as it becomes more accessible and consumed. Screening time guidelines from the pediatric groups and World Health Organization (WHO) recommend that preschoolers limit their screen time to one hour per day. However, only 15% of families meet these requirements.[6,7]

Infants are first exposed to mobile phones when their parents use video calling to connect with relatives. As parents watch

television, babies are exposed to background television. Digital media devices are occasionally used by caregivers to help children relax. Today's children are growing up with technologies such as mobile and smart devices in both housing and educational conditions. The American Academy of Pediatrics (AAP), suggests that infants under the age of two not be exposed to media. Nevertheless, babies are frequently exposed to screens before the age of 12 months.[8]

A child's average per day exposure to screens raises significantly with age. Children aged 0 to 8 use multimedia devices for an average of two and a half hours per day. The majority of screen time is spent watching television or internet. Children's media usage time rose by 32% over the last two decades. Approximately 74% of families report that their children under two years watch television.[9]

Media-centric parents leads to children spending an average of 4.30 hours daily on screens. Media-moderate parents, regulates screen time and material use, and promotes outside and imaginative activities. Household income, education of parents, family environment, race, and ethnic background all have an impact on how much media children consume.[9]

Research suggests a negative link between infant screen exposure and child development.[10,11] Screen exposure in infants and preschool children has a negative impact on their overall wellness, development, concentration, sleeping, physical activity, communication, language skills, socio-emotional health, and behaviors, demonstrating a link between screen time and development of children.[11-15] Parents who frequently use smartphones and other devices without their children may have limited interaction time, potentially reducing their children's language development. Social interaction in childhood significantly impacts children's social competence. Moon et al.[16] found a negative correlation with expressive language months.

Exceeding screen time guidelines at two and tree years of age results in increased behavioral problems and DDs at three and five years. Pediatrics is studying whether there is a dose-response relationship between screen time and child outcomes, particularly in preschoolers.[11,17] Understanding the effects of screen exposure in infancy and toddlerhood can aid in the creation of successful public health measures for high-risk families.

We aim to investigate the the child and parent sociodemographic factors thought to contribute to early childhood DD, as well as the impact of screen exposure on a child's motor and language development between the ages of 6 and 60 months.

METHODS

The study was conducted in accordance with the Declaration of Helsinki. Ethics Committee Approval of the study was carried out with the permission of the Dışkapı Yıldırım Beyazıt Training and Research Hospital' Ethics Committee, (Date 25.11.2019 Decision No:76/03). The study included a community sample of mother-child pairs recruited during routine visits to Family Health Center between aged 6 to 60 months. We interviewed the 230 mothers face to face, using a questionnaire to collect descriptive data, socioeconomic demographic information, and parameters for screen exposure. The questionnaire has two parts: The first section discussed the characteristics of the children, such as gestational age, delivery method, gender, birth weight, and medical history. The second part discussed children's screen exposure characteristics, such as screen type, time, and parental control. Mothers reported that their children spent their usual days viewing television (TV), utilizing the phone and computer/i-pad. Following that, children's gross motor, fine motor-adaptive, language, and personal-social development were evaluated using the DDST-II. A physical therapist with at least three years of experience using the DDST-II made the tests. The standard test with, adapted for Turkish children, and was administered by the same child development-education specialist who was unaware of the cases' history and neurological examination. The abilities of the subjects with appropriate conditions (full and clean) in personal-social, fine motor, language and gross motor areas were measured. DDST-II organized into four main groups: gross motor, fine motor-adaptive, language, and personal-social. The tool classifies children into three categories: normal, suspect, and untested. The tool evaluates skills passed by 75% to 90% of children, with 'caution' labels for failures and 'delay' labels for not performing activities passed by 90%. When the subject receives one delay or two or more warns, outcome is regarded as questionable. If two or more delays occur, the outcome is regarded as abnormal. For the overall score, patient's outcomes in subgroups are evaluated using the same rule as normal, questionable, and abnormal.[2,3] Healthy infants with no background conditions or diagnosed DD at the time of recruitment were considered. Exclusion criteria included twins, and severe neurological conditions. Children with an elevated risk or diagnosis of DD (pre-term birth, required ventilation, were taken to the newborn intensive care unit and underlying medical issues (congenital, musculoskeletal, or neurological abnormalities) were excluded. Mothers reported their children's screen time on all days of the week, including television, computers, and I pads, gaming systems. Screen time evaluated in hours per day.
Children's gender, age, type of birth, birth weight, breastfeeding status and exclusive breastfeeding length, time to transition to supplementary food, use of ready-made food, iron and vitamin D replacement status, also presence of screen exposure, duration, reasons, screen type, and whether it was parent-controlled were all assessed. The relationship between all variables and the DDST-II test results was examined.

Statistical Analysis

Study data were analyzed using IBM SPSS statistics Version 23.0 (IBM Corporation, United States). The suitability of continuous variables to normal distribution was examined with the Kolmogorov-Smirnov test. Categorical variables in the study are presented with frequency and percentage, and continuous variables are presented with mean, standard deviation, minimum and maximum values. Mann Whitney U test, chi squared and Kruskal Wallis test was used to compare the groups. Statistical significance was set at p value <0.05.

RESULTS

The study included 230 children; with 130 (56.5%) of them females and 100 (43.5%) of them males, with a mean age of 34.83 ± 16.43 months (min 6, max 60). Demographic characteristics and medical history of children were in Table1. Mothers had a mean age of 31.61±5.81 years (min 19, max

Table1. Demographic and clinical characteristics of patients (n: 230)

		n	(%)
Female		130	56.5
Male		100	43.5
Age (years) (mean)		34.83±16.43 (min 6, max 60).	
Height	<3percentile	2	0.9
	3-97 percentile	219	95.2
	>97 percentile	9	3.9
Weight	<3percentile	5	2
	3-97 percentile	209	90.9
	>97 percentile	16	7
Birth time	Term	230	100.0
Type of birth	C/S	111	48.3
	Spontan vaginal	119	51.7
Birth weight	2000-2500 gr	30	13.1
	2500-4000 gr	196	85.2
	>4000 gr	4	1.7
Breastfeeding	None	9	3.91
	0-3 month	5	2.17
	3-6 month	6	2.61
	6-12 month	62	26.96
	12-24 month	148	64.35
Switching to supplementary food	0-3 month first 3 months	1	0.43
	3-6 month	40	17.40
	6.month	189	82.17
Use of packaged products in supplementary food	None	101	43.91
	Rare	42	18.26
	Sometimes	43	18.70
	Usually	44	19.13
Current use of packaged food	None	26	11.30
	Rare	62	26.96
	Sometimes	108	46.96
	Usually	34	14.78
Prophylaxis of vitamin D	Yes	216	93.9
	No	14	6.1
Prophylaxis of iron	Yes	209	90.9
	No	21	9.1
DDST-II Test	Normal	155	67.4
	Abnormal	42	18.2
	Uncertain	33	14.6

Min: minimum, Max: Maximum

45), 25.7% were employed, and 26.1% had a university degree. The mean age of their fathers was 34.96±5.88 years (min 21, max 59), with 97.4% employed and 27.8% graduated from university. Families' incomes ranged from 6.1% low to 48.7% medium and 45.2% high. The majority of parents (98.7%) married, with 1.3% divorcing. The proportion of parents who were related was 12.2%. Pregnancies were planned 85.7% of the time, and unplanned 14.3%. The majority of the mothers' pregnancies (98.3%) were monitored.

The most popular screen type was television (53.7%), followed by phones (34.7%) and computers/iPads (11.6%). The reasons given by parents for their children's screen exposure were 55.5% distraction, 30.5% feeding, and 7% sleeping. Children spent less than an hour on the screen 86 (37.7%), 1-3 hours 94 (40.8%), 3-5 hours 39 (16.8%), and more than 5 hours11 (4.7%). Parental control over children's screen time was rated;

Table 2. Screen characteristics of children

		N	%
Screen time	<1 hour	86 (230)	37.7
	1-3 hours	94 (230)	40.8
	3-5 hours	39 (230)	16.8
	>5 hours	11 (230)	4.7
Parent' control >1 hour	Never	68 (144)	47.2
	Usually	59 (144)	40.9
	Always	17 (144)	11.9
Screen types	Television	93 (173)	53.7
	Phone	60 (173)	34.7
	Computer/i-pad	20 (173)	11.6
Reason of screen exposure	Distraction	80 (144)	55.5
	Feeding	44 (144)	30.5
	Before sleeping	10 (144)	7
	Other reasons	10 (144)	7

46.9% never controlled, 41.3% usually controlled, and 11.9% always controlled (Table2).

The DDST-II test of 155 (67.4%) of the children was evaluated as normal, 42 (18.2%) as abnormal, and 33 (14.6%) as

uncertain. The mean age of those whose DDST-II test was abnormal was 46±12.3 months. Children's age, height, and body weight significantly correlated with their DDST-II test results (p<0.001). The incidence of abnormal Denver-I tests increased with increasing height, weight, and age (Table 3).

Table 3. Comparison of DDST-2 test results with children's age, height, body weight

	Normal (mean±SD)	Abnormal (mean±SD)	Uncertain (mean ± SD)	x^2	*p*
Weight (kg)	13.82±3.9	17.54±5	14.19±3.2	22.602	**<0.001***
Length (cm)	91±14	103±10.3	93±10.8	26.686	**<0.001***
Age (months)	32±17	46±12.3	34±12.3	23.003	**<0.001***

*Kruskal Wallis, SD: Standart derivation

There were no statistically significant relationships discovered between the children's birth week, type of birth, birth weight, gender, and DDST-II test results (p>0.05). There were no statistically significant relationships found between the children's parents' ages, educational status, employment, family income, parents' marriage status, or kinship status and DDST-II test results (p>0.05). There were no statistically significant associations found between the mother's age at birth, number of pregnancies, pregnancy planning status, pregnancy monitoring status, and smoking during pregnancy and Denver-II test results (p>0.05). There was no statistically significant relationship discovered between children's exclusive breastfeeding in the first 6 months, duration of exclusive breastfeeding, time to transition to complementary food, and use of packaged products in complementary food and DDST-II test results. There was no statistically significant relationship between the baby's iron and vitamin D prophylaxis intake and the DDST-II test results (p>0.05). Children exposed to screens for over an hour had abnormal DDST-II test results compared to those exposed for less than an hour (p<0.001). Children exposed to screens for more than 3 hours had a higher rate of abnormal DDST-II test results than those exposed for 1-3 hours (p < 0.001) (Table 4). DDST-II test results were significantly associated with parental control over screen exposure (p<0.001). The rate of abnormal DDST-II results was higher in children who had no parental control over screen time (Table 4).

DISCUSSION

Our research suggests that excessive screen time is the first factor in DDs, with higher screen time at 6-60 months leading to poorer performance on developmental screening tests and lower scores. Early detection, rehabilitation, and identification of etiological factors for children at risk of DD is critical in developing countries, where over 200 million children are unable to fully develop.[18] In the current study, we investigated the child and parents sociodemographic factors thought to contribute to early childhood DD, as well as the effect of screen exposure on DD. Screen time exceeding the WHO' guidelines of one hour per day was linked with increased delays in developmental milestone achievement.

While some studies suggest that male gender, maternal age of ≥ 35, low education, consanguineous marriage, low family socioeconomic status, lack of iron supplementation, cesarean section delivery, and birth order increases the risk of DD, others found no correlation.[18]

The results of the DDST-II test did not correlate with the mother's pregnancy or birth history, the parents' sociodemographic traits, or the child's demographic characteristics, exclusive breastfeeding, iron and vitamin D prophylaxis, as reported in the literature.

Screen time for children under five ranged from 0.1 to 5 hours per day and children aged 24- 60 months were watching on average 2 hours per day in recent studies.[11,20] In our study, most of children' 40.8% screen time between 1-3 hours. The amount of screen time in our research was consistent with a recent report. No gender differences in screen time were found concordant with the previous research.[21]

According to studies, screen time can be accessed via computers, television, iPads smartphones, or mobile games. Children under the age of five prefer television over other digital devices, whereas older children prefer computers.[20,22,23] The most common screen type was television in our study. Our participants may have been exposed to television because they were younger and under the age of five.

Parents' perceptions, attitudes, beliefs, and time spent with their children all have a significant impact on their children's screen exposure.[24,25] Children's screen exposure is positively associated with access to gadgets, screen time rules, and parenting skills,

Table 4. Comparison of DDST-2 test results and screen exposure characteristics

	Normal (%)	Abnormal (%)	Uncertain (%)	X'	*p*
Screen exposure >1 hour					
Yes	82 (56.9)	37 (25.7)	25 (17.4)	20.328	**<0.001***
No	73 (84.9)	5 (5.8)	8 (9.3)		
Screen exposure time					
1-3 hours	64 (68.8)	12 (12.9)	17 (18.3)	24.256	**<0.001***
>3 hours	18 (36.0)	25 (50.0)	7 (14.0)		
Parent screen time control					
Always	14 (82.4)	2 (11.8)	1 (5.9)	17.374	**0.002***
Usually	39 (66.1)	8 (13.6)	12 (20.3)		
Never	29 (43.3)	27 (40.3)	11 (16.4)		

*Chi-square test

whereas parental confidence and good care type have a negative impact on screen time.[23,27] Parental consideration can trigger conflicts, and children may mimic screen-time habits. As previously observed, children with no parental control over screen exposure had a higher rate of screen time and worse results in Denver-II test in our research.[22,26] At this point, we saw how important parental screen time control is in child DD.

Insufficient screen exposure and content has been linked to delayed motor, cognitive, and language development in children.[10-17,27] Uncontrolled viewing of indiscriminate content from the media, especially unsupervised material, has the potential to negatively impact a child's behavior.[28] As children get older, they spend more time on screens. Screen time is positively correlated with age, sedentary choices, poor sleep, interrupted sleep at night, and delayed cognitive achievements, and hyperactivity.[26-30] The long-term impacts of screen exposure are anticipated to result in poorer behavioral results in children as they getting older. Children who use digital media excessively are less likely to engage in healthy activities.[29] This can result in unfavorable behavioral effects such as aggression and antisocial behaviors, reduced success in school and an increased prevalence of overweight, obesity, and noncommunicable diseases.[28] Screen time may impair developmental outcomes by replacing possibilities for learning such as learning a language and motor skills. Our study discovered a strong connection between increased screen time and poor developmental measures throughout various fields, supporting previous research.[11]

Limitations

Our study had the following limitations: it was a single-center study and DDST-II could be reapplied at later ages, and a correlation with increased duration of screen exposure could be observed over time. Multicenter studies with a greater number of patients and longer follow-up times are required.

CONCLUSION

The study reveals a high prevalence of excessive screen time in under-five children and a direct link to poor DDST-II performance. Understanding screen-based tasks, home-based regulations, and parental choices are crucial for screen time reduction. Pediatricians should investigate parents' screen time history and develop guidelines for permissible limits and interventions.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Dışkapı Yıldırım Beyazıt Training and Research Hospital' Ethics Committee, (Date 25.11.2019 Decision No:76/03).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Shahshahani S, Vameghi R, Azari N, Sajedi F, Kazemnejad A .Validity and reliability Determination of Denver Developmental Screening Test-II in 0-6 year–olds in Tehran. *Iran J Pediatr*. 2010;20(3):313-322.
2. Anlar B, Bayoğlu B, Yalaz K. In: Denver II gelişimsel tarama testi el kitabı. Ankara: Anlar B, Hacettepe Üniversitesi Hastaneleri Basımevi; 2007. 1–61.
3. Chiu SH, DiMarco MA. A pilot study comparing two developmental screening tools for use with homeless children. *J Pediatr Health Care*. 2010;24(2):73-80. doi:10.1016/j.pedhc.2009.01.003
4. Kütük MÖ, Gökçen C, Aksu GG. Screening results of the psychomotor development of children at inpatient unit of a training and research hospital in Turkiye. *Çukurova M J*. 2019; 44(2): 453-8, doi:10.17826/cumj.462821
5. Doğan N, Samancı N, Sarı E. Effect of gender and parental educational level on Denver Developmental Screening Test-II in healthy children aged 6 months to 6 years. *Zeynep Kamil M J*. 2023; 54(2): 97 - 101. doi:10.14744/zkmj.2022.88156
6. Council on communications and media. Media and young minds. *Pediatrics*.2016; 138(5):e20162591. doi:10.1542/peds.2016-2591
7. Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age. WHO. 2019.
8. Panjeti-Madan VN, Ranganathan P. Impact of screen time on children's development: cognitive, language, physical, and social and emotional domains. *Multimodal Technologies and Interaction*. 2023; 7(5):52. doi: 10.3390/mti7050052
9. Carson V, Ezeugwu VE, Tamana SK et al. Associations between meeting the Canadian 24-hour movement guidelines for the early years and behavioral and emotional problems among 3-year-olds. *J Sci Med Sport*. 2019;22(7):797-802. doi: 10.1016/j.jsams.2019.01.003
10. Hill MM, Gangi D, Miller M, Rafi SM, Ozonoff S. Screen time in 36-month-olds at increased likelihood for ASD and ADHD. *Infant Behav Dev*. 2020;61:101484. doi: 10.1016/j.infbeh.2020.101484
11. Madigan S, Browne D, Racine N, Mori C, Tough S. Association between screen time and children's performance on a developmental screening test. *JAMA Pediatr*. 2019;173(3):244-250. doi:10.1001/jamapediatrics.2018.5056
12. Kushima M, Kojima R, Shinohara R et al. Japan environment and children's study group. Association between screen time exposure in children at 1 year of age and autism spectrum disorder at 3 years of age: the Japan environment and children's study. *JAMA Pediatr*. 2022;176(4):384-391. doi: 10.1001/jamapediatrics.2021.5778
13. Kim TV, Pham TND, Nguyen CLD, Nguyen TTD, Okely AD, Tang HK. Prevalence of physical activity, screen time, and sleep, and associations with adiposity and motor development among preschool-age children in Vietnam: The SUNRISE Vietnam pilot study. *Indian J Pediatr*. 2022;89(2): 148-153. doi:10.1007/s12098-021-03895-2
14. Chong WW, Abd Rahman FN, Harun NA. Screen time of children with speech delay: a cross-sectional study in a tertiary center in Kuantan, Malaysia. Pediatr Int. 2022; 64(1):e15105. doi:10.1111/ped.15105
15. Oflu A, Tezol O, Yalcin S et al. Excessive screen time is associated with emotional lability in preschool children. *Arch Argent Pediatr*. 2021;119(2): 106-113. doi: 10.5546/aap.2021.eng.106
16. Moon JH, Cho SY, Lim SM et al. Smart device usage in early childhood is differentially associated with fine motor and language development. *Acta Paediatr*. 2019;108(5):903-910. doi: 10.1111/apa.14623
17. Carson V, Ezeugwu VE, Tamana SK et al. Associations between meeting the Canadian 24-hour movement guidelines for the early years and behavioral and emotional problems among 3-year-olds. *J Sci Med Sport*. 2019;22(7): 797-802. doi:10.1016/j.jsams.2019.01.003
18. Demirci A, Kartal M. Sociocultural risk factors for DD in children aged 3-60 months: a nested case-control study. *Eur J Pediatr*. 2018;177(5):691-697. doi: 10.1007/s00431-018-3109-y

19. Kumar R, Bhave A, Bhargava R, Agarwal GG. Prevalence and risk factors for neurological disorders in children aged 6 months to 2 years in northern India. *Dev Med Child Neurol*. 2013;55(4):348-356. doi:10.1111/dmcn.12079

20. Kaur N, Gupta M, Malhi P, Grover S. Screen time in under-five children. *Indian Pediatr*. 2019;56(9):773-788.

21. Carson V, Spence JC, Cutumisu N, Cargill L. Association between neighborhood socioeconomic status and screen time among pre-school children: a cross-sectional study. *BMC Public Health*. 2010;10:367. doi: 10.1186/1471-2458-10-367

22. Christakis DA, Garrison MM. Preschool-aged children's television viewing in child care settings. *Pediatrics*. 2009;124(6):1627-1632. doi:10.1542peds. 2009-0862

23. Verma S, Suman N, Verma P. Effect of electronic gadgets on cognitive milestones of children below 2 years of age. *IAIM*. 2018; 5(6): 52-54.

24. Paudel S, Jancey J, Subedi N, Leavy J. Correlates of mobile screen media use among children aged 0-8: a systematic review. *BMJ Open*. 2017;7(10): e014585. doi: 10.1136/bmjopen-2016-014585

25. Duch H, Fisher EM, Ensari I, Harrington A. Screen time use in children under 3 years old: a systematic review of correlates. *Int J Behav Nutr Phys Act*. 2013; 10:102.

26. Emond JA, Tantum LK, Gilbert-Diamond D, Kim SJ, Lansigan RK, Neelon SB. Household chaos and screen media use among preschool-aged children: a crosssectional study. *BMC Public Health*. 2018;18(1):1210. doi: 10.1186/s12889-018-6113-2

27. Lin LY, Cherng RJ, Chen YJ, Chen YJ, Yang HM. Effects of television exposure on developmental skills amongyoung children. *Infant Behav Dev*. 2015; 38:20-6. doi: 10.1016/j.infbeh.2014.12.005

28. Pagani LS, Fitzpatrick C, Barnett TA, Dubow E. Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. *Arch Pediatr Adolesc Med*. 2010;164(5):425-431. doi: 10.1001/archpediatrics.2010.50

29. Kourlaba G, Kondaki K, Liarigkovinos T, Manios Y. Factors associated with television viewing time in toddlers and preschoolers in Greece: the GENESIS study. *J Public Health*. 2009; 31(2):222-30. doi: 10.1093/pubmed/fdp011

30. Cheng S, Maeda T, Yoichi S, Yamagata Z, Tomiwa K. Japan children's study group. Early television exposure and children's behavioral and social outcomes at age 30months. *J Epidemiol*. 2010;20 (Suppl 2):S482-S489. doi:10.2188/jea.je20090179

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Original Article

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Effects of long-term high-dose medroxyprogesterone acetate use on bone mineral density in postmenopausal women

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ABSTRACT

Aims: The aim of this study was to investigate the relationship between long-term depot medroxyprogesterone acetate (DMPA) use and bone mineral density (BMD) in postmenopausal women.

Methods: This study was conducted on 40 postmenopausal women who presented at the SSK Okmeydanı Training and Research Hospital Gynecology and Obstetrics Polyclinic. The sample for the study was randomly selected from postmenopausal women and divided into the control group (N=20) and the medroxyprogesterone acetate group (N=19).

Results: A total of 39 participants were included in this study, 19 cases and 20 controls. Long-term DMPA users had higher BMD compared with the control group. These differences from the control group were statistically and potentially clinically significant. The BMD in the control group has decreased significantly during one year of study. Based on the results, the long-term use of DMPA significantly affects the bone mineral density in postmenopausal women, increasing BMD.

Conclusion: Long-term use of DMPA was associated with improved BMD after treatment. The findings demonstrate the need for long-term, controlled, prospective studies with adequate sample size to evaluate the potential clinical impact of DMPA use on bone health outcomes in postmenopausal women.

Keywords: Depot medroxyprogesterone acetate, bone mineral density, osteoporosis, postmenopause, women

INTRODUCTION

The menopause period is considered one of the three main periods in a woman's life.[1] This period attracted more attention to be considered one of the natural processes of a woman's life instead of a disease experienced by women.[2] Women experience a different quality of life, acute onset, rapid, mostly irreversible changes in the menopause period.[3] The main reason for these changes is the decrease in estrogen due to ovarian insufficiency and the estrogen deficiency experienced in all systems with estrogen receptors. The changes experienced in the postmenopausal period are primarily divided into two groups: the short-term and the long-term. The changes occurring in the long term are more serious and effective. The two long-term changes are related to the cardiovascular system and osteoporosis. Osteoporosis is a progressive decrease in bone mineral density with systemic involvement.[4] Bone density decreases in this way, causing fracture formation due to microtrauma.[5] Osteoporosis, which could not be diagnosed until this point, where treatment options are limited. While there is no definitive cure for osteoporosis, treatment can help slow or halt the loss of bone density and reduce the risk of fractures.[6] This study's primary purpose was to investigate the consequences of long-term high-dose medroxyprogesterone acetate (DMPA) use on bone mineral density in postmenopausal women.

Osteoporosis is the most prevalent bone disease in humans, posing a significant public health concern.[7] It is more common in individuals of Caucasian descent, women, and the elderly.[8] Osteoporosis simply means decreased bone density. Osteoporosis is defined as "a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue with a consequent increase in bone fragility and susceptibility to fracture".[9] Osteoporosis is among the important diseases seen in the elderly population. It is one of the systemic diseases frequently encountered in clinical practice, such as heart, stroke, diabetes and cancer. It is a significant public health issue that affects millions of people worldwide. Approximately 10 million Americans over the age

of 50 have osteoporosis, and an additional 34 million are at risk of developing the disease.[10] Accurate statistics regarding the number of patients in Turkiye are not available.[11] However, in 2010, there were more than 24,000 hip fractures in individuals aged 50 years or older, with 73% occurring in women.[12]

DMPA is an injectable contraceptive that women widely use worldwide.[13] There are inconsistent information about the recovery of bone mass with long-term use of DMPA.[14] Because of the discussions, the use of the DMPA in women was decreasing.[15] Limited research was done on the role of DMPA in reducing osteoporosis and increasing bone quality in postmenopausal women. The majority of conducted studies focus on young women.[16-21] The leading cause of postmenopausal osteoporosis is estrogen deficiency.[22] However, recent studies have questioned the effect of progesterone used together with estrogen in hormone replacement therapy on bone density. There are three questions here.

What is the role of progesterone in natural internal balance? Is progesterone effective in bone metabolism, and/or what role does it play? Does progesterone have an additional effect on hormone replacement therapy?
In order to find answers to these questions, this study compared the bone densities of postmenopausal patients after one year of treatment by DMPA. The aim of this randomized controlled trial study was to investigate differences in BMD in long-term users of DMPA in postmenopausal women.

METHODS

This study is the scientific study of Altuğ Semiz master's thesis named "Effects Of Long-Term High-Dose Medroxyprogesterone Acetate Use On Bone Mineral Density In Postmenopausal Women", registered at the National Thesis Center with the number 103431 dated 2004. All procedures conducted in this study were in accordance with ethical guidelines and the principles outlined in the Declaration of Helsinki.

This study was conducted on 40 postmenopausal women who applied to the SSK Okmeydanı Training and Research Hospital Gynecology and Obstetrics Polyclinic between April 2001 and November 2002.

The sample for the study was selected randomly among postmenopausal women. The sample was divided into the control and medroxyprogesterone acetate groups (the case group). Twenty women were included in the study in the medroxyprogesterone acetate group, and the study was completed with 19 cases. One patient declined to participate in the study. The number of patients selected as the control group was 20 cases, and all patients completed the study. The number of women who entered menopause naturally was 30, and the number of women who had surgical menopause was 10. Premature menopause was not detected in the women. All patients in both groups underwent a complete gynecological examination.

In the case group, 20 mg medroxyprogesterone acetate (Farlutal tab. 5 mg. 2x2) was used orally for ten days during the second half of menstruation, and this treatment was continued for one year. No treatment was applied to the patients in the control group. Their follow-up was continued for one year. Patients in both groups received 1000 mg of calcium supplements per day.

The women included in the study were requested to meet the following criteria for the postmenopausal period: 6-12 months of secondary amenorrhea, FSH >25, LH >30, E2 <40, and normal prolactin levels in hormone measurements.

It was stipulated that the patients had not previously used any treatment for menopause or protection against osteoporosis, as this could affect the study results. In addition, it was ensured that the patients did not have any secondary problems predisposing to osteoporosis and that they had not received steroid treatment for any reason in the recent past. It was ensured that the patients did not use contraceptives and/or hormonal preparations for other reasons during the study period.

T-score ("Number of standard deviations above or below bone mineral density of age-matched controls") and Z-score ("Number of standard deviations above or below bone mineral density of young normal mean") were used to evaluate the hypotheses of this study. According to World Health Organization (WHO) criteria, osteoporosis is defined as T-score ≤−2.5. Osteopenia is defined as between T-scores (−1 and−2.5). Severe osteoporosis is defined as T-score >−2.5. Normal bone is defined as T-score >−1.[23]

Statistical Analysis

Minimum, maximum, mean (M), and standard deviation (SD) were used for descriptive characteristics for numerical values. The Shapiro–Wilk test was used as the normality test of continuous data. The Wilcoxon Signed-Rank test was used to compare the T-score and Z-score in the case and control groups. A general linear model was used to test the impact variables on each other. SPSS v22 was used for statistical analysis. A value of p 0.05 was accepted as statistically significant.

RESULTS

The patients in case group with a mean age of 49.2 years and a mean body weight of 76.36 participated in the study. Women in control group with a mean age of 49.65 years and a mean body weight of 74.85 participated in the study. Descriptive statistics of T-Score and Z-Score were presented according to the groups and are shown in Table 1.

In both groups, the difference between T-Score 1 and T-Score 2 was compared using the Wilkoxon Sign Ranks Test and the following results were obtained: in the study group, T-Score 2 value was higher than T-Score 1 in 15 cases, T-Score 2 value was lower than T score 1 in 3 cases and remained the same in 1 case (Table 2). According to these results, bone mineral density increased in 15 cases, decreased in 3 cases and remained the same in 1 case (n=19). In terms of Z-Scores, Z-Score 2 was higher than Z-Score 1 in 16 cases, Z-Score 2 was lower than Z-Score 1 in 3 cases and no equal cases were observed. With these results, according to Z-Scores, bone density increased in 16 cases compared to young adults and decreased in 3 cases (Table 2).

There is a significant difference in favor of loading between T-Score 1 and T-Score 2 and Z-Score 1 and Z-Score 2 in the case group (p<0.01). T-Score 2 value was found to be lower than T-Score 1 in 18 cases, and T-Score 2 value was found to be higher than T-Score 1 in 2 cases. As a result of these values, it was observed that bone mineral density decreased in 18 cases and bone mineral density increased in 2 cases.

Table 1. Descriptive statistics of T-Score and Z-Score

		N	Minimum	Maximum	Mean Rank	Std. Deviation
T-Score 1	Case	19	-3.2	1.6	-1.101	1.0991
	Control ranks	20	-2.8	1.2	-.700	1.2222
T-Score 2	Case	19	-2.17	1.70	-.4321	1.17547
	Control ranks	20	-3.00	0.85	-1.4270	.91680
Z-Score 1	Case	19	-2.18	1.03	-.7411	.85027
	Control ranks	20	-1.90	1.40	-.2285	1.07619
Z-Score 2	Case	19	-2.00	1.70	-.1137	1.04290
	Control ranks	20	-2.40	1.20	-.9065	.90604

Table 2. The comparison of study variables in case group

		N	Mean Rank	Sum of ranks	Z	p-value
T-Score 2-T-Score 1	Negative ranks	3[a]	8.83	26.50	-2.570	.010
	Positive ranks	15[b]	9.63	144.50		
	Ties	1[c]				
	Total	19				
Z-Score 2-Z-Score 1	Negative ranks	3[d]	11.33	34.00	-2.455	.014
	Positive ranks	16[e]	9.75	156.00		
	Ties	0[f]				
	Total	19				

a: TScore2<TScore1; b: TScore2>TScore1; c: TScore2=TScore1; d: ZScore2<ZScore1; e: ZScore2>ZScore1; f: ZScore2=ZScore1.

Z-Score 2 was lower than Z-Score 1 in 17 cases, Z-Score 2 was greater than Z-Score 1 in 1 case, and the two measurement results were the same in 3 cases. According to these results, bone density decreased in 17 cases, increased in 1 case, and remained the same in 3 cases in the average bone mineral density of the young adult population (Table 3).

General linear model was used to examine the effect of Medroxyprogesterone Acetate use on bone mineral density (Table 4 and 5). Statistically significant differences were found in both parameters of T-Score and Z-Score values ($p<0.01$).

The graphical representation of the change in bone mineral density in one year in patient groups using and not using Medroxyprogesterone Acetate can be expressed in Figure. T-Score and Z- score are statistically significant changes in both groups.

Table 3. The comparison of study variables in control group

		N	Mean Rank	Sum of ranks	Z	p-value
T-Score 2-T-Score 1	Negative ranks	18[a]	11.47	206.5	-3.793	<.001
	Positive ranks	2[b]	1.75	3.5		
	Ties	0[c]				
	Total	20				
Z-Score 2-Z-Score 1	Negative ranks	17[d]	9.91	168.50	-3.616	<.001
	Positive ranks	1[e]	2.50	2.50		
	Ties	2[f]				
	Total	20				

a: TScore2<TScore1; b: TScore2>TScore1; c: TScore2=TScore1; d: ZScore2<ZScore1; e: ZScore2>ZScore1; f: ZScore2=ZScore1.

Table 4. General Linear Model of T-Score

Groups	Factors	N	Mean	p-value	Std. error	95% confidence interval	
						Lower bound	Upper bound
Control	T-Score 1	20	-.700	<.001	.260	-1.227	-.173
	T-Score 2	20	-1.427	<.001	.235	-1.903	-.951
Case	T-Score 1	19	-1.101	<.001	.267	-1.642	-.559
	T-Score 2	19	-.432	<.001	.241	-.920	.056

Table 5. General Linear Model of Z-Score

Groups	Factors	N	Mean	p-value	Std. error	95% confidence interval	
						Lower Bound	Upper Bound
Control	Z-Score 1	20	-.229	<.001	<.001	-.669	.212
	Z-Score 2	20	-.907	<.001	<.001	-1.348	-.465
Case	Z-Score 1	19	-.741	<.001	<.001	-1.193	-.289
	Z-Score 2	19	-.114	<.001	<.001	-.567	.340

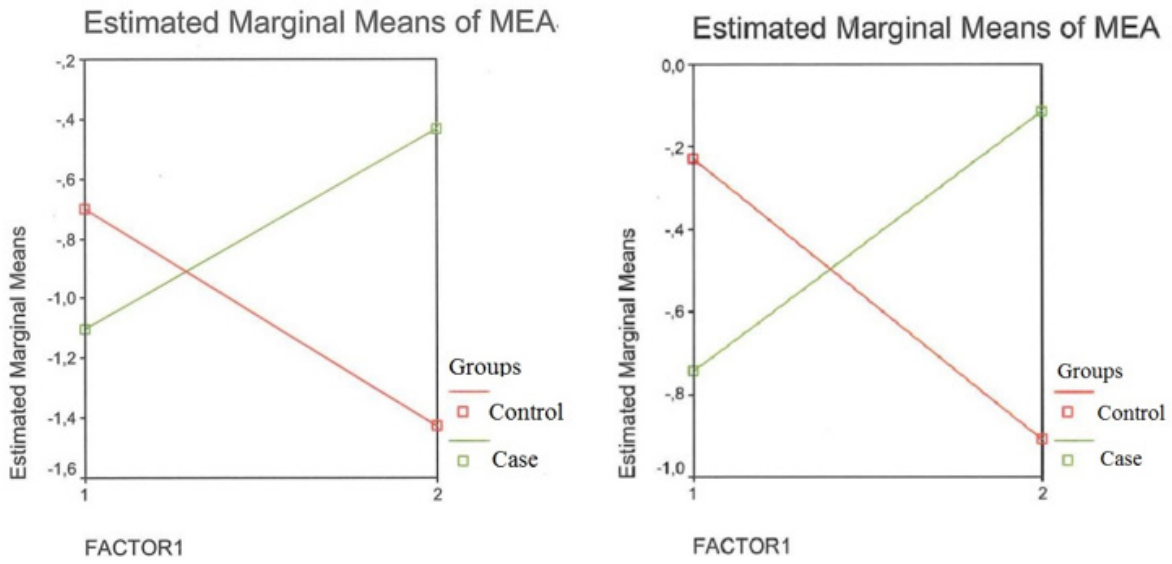

Figure. T-Score and Z-Score significant changes

DISCUSSION

The present study examined the impact of long-term high-dose DMPA use on bone mineral density in postmenopausal women. Based on the findings, the prolonged use of DMPA significantly impacts the bone mineral density of postmenopausal women and increases BMD. The impact of DMPA on bone density has sparked significant controversy. In this section, the current study's findings are compared and discussed in relation to the findings of previous studies.

Gallagher et al. [24] studied impact of high dose progesterone (20 mg medroxyprogesterone acetate) on bone mineral density. The study showed that medroxyprogesterone acetate significantly reduced the loss of bone mineral density from cortical bones of the skeletal system compared to placebo. Viola et al.[25] found a statistically meaningful distinction in forearm BMD measures between postmenopausal women who had been long-term users of DMPA and control group users. BMD was significant higher in the long-term users of DMPA. In this study, three comparisons were made between different time points: the first and third year, the second and third year, and the fourth and fifth year after menopause.[25] These results were in line with our study. In another study, Viola et al.[26] made the same comparison among menopausal women between 1 and 15 years. This study found no negative impact on forearm BMD measures in long-term DMPA users with less than 13 years of use. Sanches et al.[27] reported no significant differences between postmenopausal women who had used DMPA and control group women at 1 and 2-3 years periods in terms of the bone mineral density. Modesto et al.[28] reported that the long-term use of DMPA has been linked to low bone mass and osteoporosis in women who have utilized DMPA for ten years or more. Additionally, DMPA users with longer duration of use exhibited greater loss of bone mass. What is clear is that the reduction in BMD among DMPA users remains a controversial issue, and further studies considering other influencing variables are still needed. This study holds great value as it is one of the pioneering research in this area in Turkiye. Considering the importance of osteoporosis in elderly women, this study should be repeated with more samples in Turkiye to obtain more reliable results. These results can be the basis of treatment protocols in Turkiye.

This investigation has several limitations. One important limitation is the retrospective design. Additionally, the sample size is relatively small due to financial constraints. The study did not consider demographic characteristics such as calcium intake, smoking and BMI in the women, which may affect BMD. It is recommended that future research gather samples while taking these factors into account. Therefore, further studies with larger sample sizes are needed to clarify the effect of DMPA on BMD in postmenopausal women.

CONCLUSION

As a result of our study with a randomized control group and a one-year follow-up period observed that the use of 20 mg medroxyprogesterone Acetate daily in postmenopausal women was statistically significant in increasing BMD. A statistically significant decrease in bone density was observed in the control group. The tolerability of the drug was generally observed well.

According to results, it is revealed that progesterone has a positive influence on bone turnover and increases bone density. However, controlled and prospective studies with adequate sample size are needed to confirm our knowledge on of the clinical consequence of DMPA use on bone health outcomes.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study is the scientific study of Altuğ Semiz master's thesis named "Effects Of Long-Term High-Dose Medroxyprogesterone Acetate Use On Bone Mineral Densıty In Postmenopausal Women", registered at the National Thesis Center with the Decision No: 103431, Date: 2004.

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study had no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

REFERENCES

1. Rostami-Moez M, Masoumi SZ, Otogara M, Farahani F, Alimohammadi S, Oshvandi K. Examining the health-related needs of females during menopause: a systematic review study. *J Menopausal Med*. 2023;29(1):1-20. doi:10.6118/jmm.22033
2. Uzun S, Ozcan H, Jones D. The psychological dimension of menopause: a phenomenological study: being menopause in Turkiye: a qualitative study. *Curr Psychol*. 2023;42(13):10498–507.
3. Habeeb S. Menopause: transition, effects, and methods. in: encyclopedia of sexual psychology and behavior. *Springer*. 2023. p. 1–12.
4. Zhang S, Huang X, Zhao X, et al. Effect of exercise on bone mineral density among patients with osteoporosis and osteopenia: a systematic review and network meta-analysis. *J Clin Nurs*. 2022;31(15-16):2100-2111. doi:10.1111/jocn.16101
5. Watts NB, Binkley N, Owens CD, et al. Bone mineral density changes associated with pregnancy, lactation, and medical treatments in premenopausal women and effects later in life. *J Womens Health (Larchmt)*. 2021;30(10):1416-1430. doi:10.1089/jwh.2020.8989
6. Kołodziejska B, Stępień N, Kolmas J. The influence of strontium on bone tissue metabolism and its application in osteoporosis treatment. *Int J Mol Sci*. 2021;22(12):6564. doi:10.3390/ijms22126564
7. Bonnick SL. Osteoporosis in men and women. *Clin Cornerstone*. 2006;8(1):28-39. doi:10.1016/s1098-3597(06)80063-3
8. Sözen T, Özışık L, Başaran NÇ. An overview and management of osteoporosis. *Eur J Rheumatol*. 2017;4(1):46-56. doi:10.5152/eurjrheum.2016.048
9. Dimai HP, Fahrleitner-Pammer A. Osteoporosis and fragility fractures: currently available pharmacological options and future directions. *Best Pract Res Clin Rheumatol*. 2022;36(3):101780. doi:10.1016/j.berh.2022.101780
10. Dempster DW. Osteoporosis and the burden of osteoporosis-related fractures. *Am J Manag Care*. 2011;17 (Suppl 6):S164-S169.
11. Tuzun S, Eskiyurt N, Akarirmak U, et al. Incidence of hip fracture and prevalence of osteoporosis in Turkey: the FRACTURK study. *Osteoporos Int*. 2012;23(3):949-955. doi:10.1007/s00198-011-1655-5
12. Keskin Y, Cekin Md, Gündüz H, et al. The prevalence of osteoporosis in the thrace region of Turkey: a community-based study. *Turk J Phys Med Rehabil Fiz Tip Ve Rehabil Derg*. 2014;60(4):335-340
13. Rajaraman R, Vaithilingan S, Selvavinayagam TS. Acceptance, adherence, and side effects of depot medroxyprogesterone acetate: a prospective observational study. *Cureus*. 2024;16(4):e58700. doi:10.7759/cureus.58700
14. Kaunitz AM, Arias R, McClung M. Bone density recovery after depot medroxyprogesterone acetate injectable contraception use. *Contraception*. 2008;77(2):67-76. doi:10.1016/j.contraception.2007.10.005
15. Roksvaag I, Skjeldestad FE. Decreasing trends in number of depot medroxyprogesterone acetate starters in Norway - a cross-sectional study. *Acta Obstet Gynecol Scand*. 2018;97(2):151-157. doi:10.1111/aogs.13262
16. Kaunitz AM. Depot medroxyprogesterone acetate (DMPA): efficacy, side effects, metabolic impact, and benefits. UpToDate Accessed March 23 2023 Dispon En Httpswww Uptodate Comcontentsdepot-Medroxyprogesteroneacetate-Dmpa-Effic-Side-Eff-Metab-Impact--*Benefits*. 2022;
17. Clark MK, Sowers MR, Nichols S, Levy B. Bone mineral density changes over two years in first-time users of depot medroxyprogesterone acetate. *Fertil Steril*. 2004;82(6):1580-1586. doi:10.1016/j.fertnstert.2004.04.064
18. Harel Z, Johnson CC, Gold MA, et al. Recovery of bone mineral density in adolescents following the use of depot medroxyprogesterone acetate contraceptive injections. *Contraception*. 2010;81(4):281-291. doi:10.1016/j.contraception.2009.11.003
19. Beksinska ME. Bone mineral density and use of depot medroxyprogesterone acetate (DMPA), norethisterone enanthate (NET-EN) and combined oral contraceptives. 2010;
20. Scholes D, Lacroix AZ, Ott SM, Ichikawa LE, Barlow WE. Bone mineral density in women using depot medroxyprogesterone acetate for contraception. *Obstet Gynecol*. 1999;93(2):233-238. doi:10.1016/s0029-7844(98)00447-5
21. Ebeisy HAEHE, Mahmoud NE, Kandeel HT, Tawwab SMSE. Bone mineral density among long term users of hormonal contraception (Contraception & Bone mineral density). *Al-Azhar Int Med J*. 2024;5(2):25.
22. Cheng CH, Chen LR, Chen KH. Osteoporosis due to hormone imbalance: an overview of the effects of estrogen deficiency and glucocorticoid overuse on bone turnover. *Int J Mol Sci*. 2022;23(3):1376. doi:10.3390/ijms23031376.
23. Rajan R, Paul J, Kapoor N, Cherian KE, Paul TV. Postmenopausal osteoporosis–an Indian perspective. *Curr Med Issues*. 2020;18(2):98–104.
24. Gallagher JC, Kable WT, Goldgar D. Effect of progestin therapy on cortical and trabecular bone: comparison with estrogen. *Am J Med*. 1991;90(2):171-178.
25. Viola AS, Castro S, Marchi NM, Bahamondes MV, Viola CF, Bahamondes L. Long-term assessment of forearm bone mineral density in postmenopausal former users of depot medroxyprogesterone acetate. *Contraception*. 2011;84(2):122-127. doi:10.1016/j.contraception.2010.11.007
26. Viola AS, Castro S, Bahamondes MV, Fernandes A, Viola CF, Bahamondes L. A cross-sectional study of the forearm bone mineral density in long-term current users of the injectable contraceptive depot medroxyprogesterone acetate. *Contraception*. 2011;84(5):e31-e37. doi:10.1016/j.contraception.2011.06.012
27. Sanches L, Marchi NM, Castro S, Juliato CT, Villarroel M, Bahamondes L. Forearm bone mineral density in postmenopausal former users of depot medroxyprogesterone acetate [published correction appears in Contraception. 2009 79(2):159-60]. *Contraception*. 2008;78(5):365-369. doi:10.1016/j.contraception.2008.07.013
28. Modesto W, Bahamondes MV, Bahamondes L. Prevalence of low bone mass and osteoporosis in long-term users of the injectable contraceptive depot medroxyprogesterone acetate. *J Womens Health (Larchmt)*. 2015;24(8):636-640. doi:10.1089/jwh.2014.5077

Altuğ Semiz

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Management of nontubal ectopic pregnancies-single center experience

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ABSTRACT

Aims: Ectopic pregnancies can be defined as pregnancies in which the growing blastocyst implants outside the endometrial cavity. However, it is assumed that 0.5-1% of all pregnancies are ectopic pregnancies. The most common extrauterine implantation site is the fallopian tube. Non-tubal pregnancies (NTG Non-tubal pregnancies) account for less than 5% of all ectopic pregnancies but cause 8 times higher maternal mortality than tubal pregnancies. The study aimed to determine the frequency of nontubal ectopic pregnancies in a tertiary care unit in Turkey and the differences that may differentiate patients from tubal ectopic pregnancies.

Methods: The purpose of this retrospective study was to analyze and describe the treatments of patients who were hospitalized for ectopic pregnancy in the Gynecology and Obstetrics Clinic of Mengücekgazi Training and Research Hospital from May 2014 to May 2024. Obstetric/gynecologic history, risk factors for previous ectopic non-tubal pregnancy, serum-hCG levels at the moment of diagnosis, ultrasound findings, surgical or medical treatment and treatment outcomes were presented.

Results: In our institutional records, 240 patients received an ectopic pregnancy diagnosis. and n=23 nontubal ectopic pregnancies were identified. Cervical pregnancy (CP) (n=2), interstitial pregnancy (IP) (n=2), cesarean scar pregnancy (ScP) (n=10), ovarian pregnancy (OvP) (n=9) were detected.

Conclusion: It emerges from our sample that NT-EP needs to be diagnosed quickly. This can assist in the conservative use of a medical or minimally invasive method. The significant advance in imaging technologies allows for a faster diagnosis, allowing the patient to be transferred to a referred center from where the best procedures can be selected, reducing the potential impact of surgery on the patient's fertility.

Keywords: Ectopic pregnancy, cervical pregnancy, scar pregnancy, interstitial pregnancy, ovarian pregnancy

INTRODUCTION

Ectopic pregnancies can be defined as pregnancies in which the growing blastocyst implants outside the endometrial cavity.[1] Since their occurrence varies among various communities and research, it is impossible to pinpoint their incidence with precision. Nonetheless, 0.5–1% of all pregnancies are thought to be ectopic gestations.[2] The fallopian tube is the most often used location for extrauterine implantation.[3] Just under five percent of all ectopic pregnancies are non-tubal pregnancies (NTG Non-tubal Pregnancies) but cause maternal mortality 8 times higher than tubal pregnancies.[4]

The most typical clinical sign of an ectopic pregnancy is discomfort in the abdomen accompanied by vaginal bleeding in the first trimester.[5] A retrospective study revealed that 376 (18%) of the 2026 pregnant patients who came to the emergency room complaining of stomach pain and vaginal bleeding in the first trimester were indeed pregnant with an ectopic pregnancy. Among these 376 patients, 76% reported vaginal bleeding and 66% reported abdominal pain.[6] The usual time for ectopic pregnancy symptoms to manifest is six to eight weeks following the previous regular menstrual cycle. The discomforts of normal pregnancy (e.g. nausea, breast tenderness, frequent urination) are sometimes present. Though progesterone, estradiol, and human chorionic gonadotropin (HCG) levels may be lower in ectopic pregnancy patients than in normal pregnant patients, early pregnancy symptoms may be less common in these individuals.[7]

The main reason why ectopic pregnancy occurs is the disruption of their normal tubal anatomy due to factors such as infection, by surgery, from congenital anomalies or neoplasms. Anatomical disruption may be preceded by functional

disturbance due to damaged ciliary activity. The higher risk is associated with a history of previous ectopic pregnancy or tubal surgery. In addition, periconceptional smoking, vaginal douching and endometriosis are also related to an increased risk of ectopic pregnancy.[1]

The fallopian tube is the site of 96% of ectopic pregnancies. In a series of 1800 surgically treated patients, the distribution of sites was ampullary (70%), isthmic (12%), fimbrial (11.1%), ovarian (3.2%), interstitial (2.4%) and abdominal (1.3%).[3] Non-tubal pregnancies include interstitial, rudimentary horn, angular, abdominal, cesarean scar, ovarian and heterotopic pregnancies. The proximal section implanted in the uterine muscle is the interstitial portion of the Fallopian tube. A pregnancy located in this area is called an interstitial pregnancy. Roughly 1% to 3% of all ectopic pregnancies are these uncommon pregnancies.[8] Rudimentary horn pregnancy is an intrauterine pregnancy located in the rudimentary uterine horn of the unicornuate uterus. In the uterine cavity, an angular pregnancy implants medially to the uterotubal junction at the lateral angle, in close proximity to the proximal ostium of the fallopian tube. An angular pregnancy is situated medially to the round ligament, unlike interstitial pregnancy.[8] An abdominal pregnancy is an uncommon kind of ectopic pregnancy where the pregnancy implants itself in the peritoneal cavity, external to the fallopian tubes, ovaries, broad ligament, and cervix. Cervical pregnancy refers to a specific kind of ectopic pregnancy when the trophoblast inserts itself into the cervical tissue surrounding the endocervical canal. Caesarean scar pregnancy is a pregnancy within or on the scar of a previous caesarean section. Pregnancies implanted on or within myomectomy scars (also called intramural pregnancy) can also occur.[9]

Primary diagnostic test for women suspected of having an ectopic pregnancy is serum ß-hCG measurement.[10] For patients with a baseline hCG level <10,000 mIU/mL, the actual expected rate of increase within 48 hours depends on the baseline hCG level; the projected growth rate is 49 percent for a baseline hCG level <1500 mIU/mL, 40 percent for a baseline hCG level 1500 to 3000 mIU/mL and 33 percent for a baseline hCG level >3000 to <10,000 mIU/mL. An increase of less than these values raises suspicion of ectopic pregnancy.[11] When the ß-HCG level is above 1500 IU/L, the absence of an intrauterine gestational sac on ultrasonography, douglas fluid, coagulum and adnexal mass suggest ectopic pregnancy.

Ultrasound is more reliable for intrauterine pregnancy confirmation because the incidence of heterotopic pregnancy is 1/7000.[12] Color Doppler can show an ectopic pregnancy as a ring-like formation. Color Doppler could offer vital information when other ultrasound data lead to a diagnostic conundrum or unclearty.[13]

Treatments for ectopic pregnancy include follow-up, medical therapy (methotrexate MTX) and surgery. Preoperative MTX treatment is now widely used in early diagnosed non-ruptured patient groups and has the advantages of less tubal damage, low cost, and less effect on subsequent conception.[14] MTX application can be performed in pregnancies without fetal heartbeat, ß-HCG less than 5000 mlU/ml, and ectopic mass diameter less than 3 cm on ultrasound.[15] In patients with advanced gestational week, adnexal mass larger than 3 cm, and unstable hemodynamics, the treatment is surgery. Salpingectomy, cornual excision, salpingooferectomy, hysterectomy are among these methods.[16]

Even though non-tubal ectopic pregnancies represent only %5 of all ectopic pregnancies, they are responsible for approximately %20 of ectopic pregnancy-related deaths.[10] New research suggests that we are not as successful in diagnosing and treating non-tubal ectopic pregnancies as tubal ectopic pregnancies.[17] Diagnosis and management of non-tubal ectopic pregnancies is clinically challenging and there are alternative treatment options that traditionally involve major surgical procedures affecting future fertility.[18]

This research aims to assess the frequency of non-tubal ectopic pregnancies in a tertiary care facility in Turkey and the features that may separate patients from tubal ectopic pregnancies.

METHODS

The study was set up with the permission of Erzincan Binali Yıldırım University clinical research ethics committee (Date: 04.07.2024, Decision No: 369119).

The study aimed to retrospectively review the data of the patients who were hospitalized in the department of obstetrics and gynecology of Mengücekgazi Training and Research Hospital between May 2014 and May 2024 due of ectopic pregnancy and who were proven to have a non-tubal location and to present the treatments used in detail. Permission to publish was obtained in accordance with the 1964 Declaration of Helsinki and its subsequent amendments or similar ethical standards. Obstetric/gynecologic history, previous risk factors for ectopic non-tubal pregnancy, serum-hCG levels at diagnosis, ultrasound findings, surgical or medical treatment and treatment outcomes are presented.

Interstitial pregnancy was diagnosed by transvaginal ultrasonography according to the criteria defined by Timor-Tritsch. Criteria for a diagnosis of caesarean scar pregnancy include the absence of fetal fragments in the uterus or cervix, visualization of a gestational sac covering the scar area or completely within the myometrium, and failure to visualize the myometrium layer between the gestational sac and the bladder on the anterior wall. Ovarian pregnancy was diagnosed during laparoscopic surgery in patients with high serum Hcg levels and hemoperitoneum.

RESULTS

Between the specified dates, a total of 240 patients were diagnosed with ectopic pregnancy in the records of our institution and n=23 nontubal ectopic pregnancies were detected. Table 1 summarizes the clinical features and history of the study group members. In hemodynamically stable individuals, serum hcg levels and transvaginal ultrasonic results formed the diagnosis. Emergency surgical procedures were performed in n=6 cases due to hemoperitpneumonia. We classified n=23 nontubal ectopic pregnancies into four categories based on implantation place: cervical pregnancy (CP) (n=2), interstitial pregnancy (IP) (n=2), cesarean scar pregnancy (ScP) (n=10), ovarian pregnancy (OvP) (n=9). (figure 1) At diagnosis, the research cohort's average age was 33.18 years. Although serum beta hcg levels were significantly higher in cesarean scar pregnancies ($p<0.005$), the mean Hcg level at diagnosis was 1896. Serum hcg levels according to treatment groups are shown in table 2.

Table 1. Demographic characteristics, obstetric and gynecological history and ectopic pregnancy risk factors in the study population.

Ectopic pregnancy	Age	Obstetric history	Gravidity (g) Parity (p) Viabil (v)	Treatment
İnterstisyel pregnancy				
Case 1	35	Nsvl	G1p1v1	Laparotomy
Case 2	29	Nsvl	G1p1v1	Laparoscopy
Ovarian pregnacy				
Case 1	36		G1	Laparoscopy
Case 2	31	1cs, 1 nsvl	G4p2v2a1	Medical
Case 3	31		G1	Laparoscopy
Case 4	28	1cs	G2p1v1	Laparotomy
Case 5	35	2cs	G3p2v2	Laparotmy
Case 6	37	2cs	G7p4v4a2	Laparoscopy
Case 7	24		G1	Laparoscopy
Case 8	36		G1	Medical
Case 9	35	1cs	G2p1v1	Laparotomy
Cervikal pregnancy				
Case 1	29		G2p0v0a1	Laparotomy
Case 2	24		G1	Medical
Scar pregnancy				
Case 1	39	2cs	G4p2v2a1	Medical
Case 2	33	1cs	G2p1v1	Medical
Case 3	43	1cs	G3p1v1a1	Medical
Case 4	29	1cs	G3p1v1ect1	Medical
Case 5	41	3cs	G4p3v3	Medical
Case 6	28	2cs	G5p2v3a1ect1	Medical
Case 7	40	1cs	G2p1v1	Medical
Case 8	32	2cs	G3p2v2	Medical
Case 9	33	2cs	G3p2v2	Medical

Cs: caserean section, g: gravidity, p: parity, v: viabil, a: abortus, ect:ektopic pregnancy, nsvl:normal spontanous vaginal labour

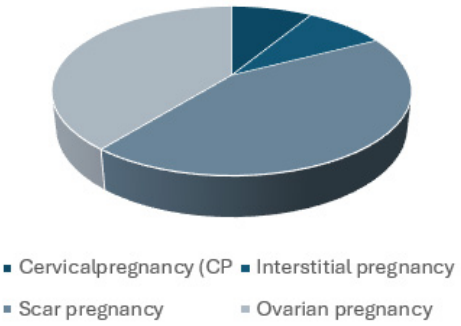

Figure 1. Non-tubal ectopic distribution by location in our center: Cervical pregnancy (CP); Interstitial pregnancy (IP); Scar pregnancy (ScP); Ovarian pregnancy (OvP)

Among the primary treatments, n=12 women were managed conservatively with medial treatment only. Surgical treatment was required in n=2 patients due to failure of initial medical treatment. In n=10 patients who were hemodynamically stable, curettage was performed following medical treatment.

Interstitial pregnancy was diagnosed by transvaginal ultrasonography according to Timor-Tritsch criteria. Cornual resection was performed for interstitial pregnancies detected in the whole study group with n=2 surgeries.

The norms for the diagnosis of caesarean scar pregnancy included the absence of fetal fragments in the uterus or cervix, visualization of a gestational sac covering the scar area or completely within the myometrium, and failure to visualize the myometrium layer between the gestational sac and the bladder on the anterior wall. For cesarean scar pregnancies n=10, vacuum curettage was performed following im MTX treatment as in cervical pregnancies.

Table 2. Non-tubal ectopic pregnancies: a single center experience. For each subtype of NT-EP are reported clinical presentation, gestational age, basal-hCG levels, ultrasound findings, treatment details(medical or surgical or medical combined with surgical)and outcome

Ectopic Pregnancy	Outset	Beta-hcg levels before treatment	Ultrasonography	Outcome
İnterstisyel pregnancy				
Case 1	Asymptomatic	2356	7 cm hematoma in the douglas	Laparotomy
Case 2	Asymptomatic	2502	GS 28mm; right horn	Laparoscopy
Ovarian pregnacy				
Case 1	Hemoperitoneum	2097	GS 29mm on the right ovary	Laparoscopy
Case 2	Asymptomatic	100	Gs 30 mm on teh left ovary	Medical
Case 3	Hemoperitoneum	5460	Ectopic on the left ovary and 2cm hematoma in the douglas	Laparoscopy
Case 4	Acute abdomen	890	5cm hematoma	Laparotomy
Case 5	Brownish vaginal discharge and mild pelvic pain	6900	Normally located ria in the cavity, left ovarian pregnancy	Laparotomy
Case 6	Hemoperitoneum	134	Gs 38 mm on the right ovary	Laparoscopy
Case 7	Mild pelvic pain	657	Ectopic on the left ovary and 3,5 cm hematoma in the douglas	Laparoscopy
Case 8	Asymptomatic	299	Ectopic on the left ovary	Medical
Case 9	Mild pelvic pain	331	Ectopic on the left ovary	Laparotomy
cervikal pregnancy				
Case 1	Vaginal bleeding and acute abdomen	---	5cm hematoma in the douglas	Laparotomy
Case 2	Vaginal bleeding	331	3cm ectopic focus at the level of the cervix	Medical
Scar pregnancy				
Case 1	Asymptomatic	70000	Crl 9 mm fhb +	Medical
Case 2	Asymptomatic	5920	6w scar pregnancy	Medical
Case 3	Asymptomatic	37460	7w fhb + scar pregnancy	Medical
Case 4	Asymptomatic	2282	10 mm gs on the scar	Medical
Case 5	Asymptomatic	31220	6w scar pregnancy	Medical
Case 6	Asymptomatic	13836	10mm gs	Medical
Case 7	Asymptomatic	7817	20 mm gs on scar	Medical
Case 8	Asymptomatic	2115	5w gs	Medical
Case 9	Asymptomatic	11641	7w fhb+	Medical

Gs: gestasyonel sac, CRL: Crown rump length, FHB: fetal heart beat

Ovarian pregnancy was diagnosed during laparoscopic surgery in patients with high serum Hcg levels and hemoperitoneum. In the ovarian pregnancies detected in the study group (n=9), laparoscopic approach was used in 3 patients, laparotomic approach in 3 patients, (oophorectomy in 1 patient, partial resection in 2 patients) and systemic methotrexate treatment in 3 patients.

Fertility preserving treatment was applied in all cervical pregnancies. MTX's one dosage im 50 mg/m2 was administered followed by ultrasonography-guided vacuum curettage.

DISCUSSION

Non-tubal ectopic pregnancies represent a considerable challenge to gynecologists because to the rarity of the condition and the current absence of recommendations for its care. With the widespread use and application of ultrasonography, it has become possible to locate the gestational sac earlier, leading to earlier diagnosis and choice of treatment without complications of ectopic pregnancies. Management of each patient should be personalized depending on clinical symptoms, viability of the pregnancy, gestational week, serum Hcg level and the woman's wishes. Specialization in the care of NT-EPs allows for faster diagnosis, giving a better chance for successful medical treatment or minimal invasive surgery including local injection of one of many agents such as MTX, potassium chloride, hyperosmolar glucose, etoposide, curettage, hysteroscopy or laparoscopy, and in the majority of instances a fertility-sparing approach becomes feasible. We describe data from a 10 year assessments of all diagnosed NT-EPs and their management thereafter. This series contributes to the growing evidence that sonography-guided curettage combined with systemic MTX is a safe and effective first-line treatment for women with high-risk NT-EP who wish to preserve future fertility.

In generally, the main treatment for interstitial and ovarian pregnancies is surgery, while systemic or local methotrexate is preferred for cesarean scar pregnancy and cervical pregnancies. In this method, it is feasible to treat patients with sufficient hcg reduction, although surgical treatments should be added in situations of excessive bleeding and treatment failure.

The status of the contralateral fallopian tube and the desire for future fertility should be considered when choosing the surgical approach. In recent years, laparoscopy has been considered a minimally invasive surgical procedure that may better preserve normal ovarian tissue and reduce pelvic adhesions.[19]

Cervical Pregnancy

The frequency of CP has been observed to be 1 in 1000-18,000 pregnancies. Because of the high hemorrhage risk of CP, it has been treated with hysterectomy in the past and resulted in loss of fertility.[20] The ease of diagnosis using the sonographic diagnostic criteria indicated by Jurkovic et al.[13] has facilitated the treatment options and especially the preservation of fertility with a conservative approach. For CP, the hysteroscopic approach is also recommended in patients with serum HCG levels greater than 5000 UI/mL, either alone or in conjunction with systemic MTX .[21] It has been shown in the study by Fowler et al.[22] that a single treatment option is not sufficient in cervical pregnancies and more than half of the patients require more than one intervention. Tremmel et al.[23] showed that treatment of cervical pregnancy with methotrexate only in 87.5% of cases was achieved. In our study, all cervical pregnancies underwent a two-stage treatment consisting of systemic methotrexate therapy followed by vacuum curettage.

Interstitial Pregnancy

IP is a very rare form of EP that causes uterine rupture, typically in advanced gestational age. It is a life-threatening illness with a 6-7 times greater fatality rate. Quantitative HCG levels and TVUS are essential to safely manage this condition. Empty uterine cavity, a separated chorionic sac at Least 1 cm from the side of the uterine cavity, lack of myometrium surrounding the gestational sac (<5 mm) and an interstitial line are diagnostic for IP.[24] Early diagnosis with TVUS leads to conservative treatment with methotrexate; surgical treatment may be required later in pregnancy. Despite studies suggesting that systemic methotrexate treatment is more successful than surgery in interstitial pregnancies, surgery was preferred in 2 cases of interstitial pregnancy detected in our study.[25] The study by Reis et al.[26] also showed cases requiring surgery due to methotrexate failure. Mao et al.[27] argued that systemic methotrexate was not beneficial and surgery should be preferred especially in cases of interstitial pregnancy larger than 1.5 cm.

Scar Pregnancy

The prevalence is predicted to grow in the next years owing to declining vaginal delivery rates and increasing cesarean section rates, and there are studies showing that the probability increases when the number of cesarean sections exceeds 2. Diagnosis is relatively easy in early pregnancy, but as the gestation continues, the differentiation between ScP, CP and low intrauterine pregnancy is more difficult. Several management options are available to treat CP, but it is unclear which is the best choice. Operative procedures alone or in combination with medical management have high success rates, but more surgical skill is required. Medical therapy is not regarded the treatment of choice for ScP, perhaps because the resorption and effectiveness of MTX is hampered by the fibrous tissue surrounding the GS, which is placed at a unique position inside the uterine cavity. MTX appears to be more effective when combined with curettage or hysteroscopy.[28] A recent intervention review concluded that it is uncertain if there is a difference between vacuum curettage under hysteroscopy and vacuum curettage under ultrasonography in terms of treatment success rates, complications, side effects or time to normalization of HCG (very low quality evidence).[29] In some studies, expectant treatment is not recommended in cesarean scar pregnancies, and if possible, operative hysteroscopy is recommended to remove the pregnancy.[30] According to some opinions, laparoscopic or laparatomic surgery in scar pregnancies is considered necessary for complete excision of the pregnancy material and restoration of the scar line.[23] In the study conducted by Altay et al.,[31] it was suggested that surgery should not be performed for cesarean scar pregnancies and vacuum curettage was performed under ultrasound guidance instead of using a sharp curette. However, other studies have shown that the success of vacuum curettage decreases in the presence of concomitant pelvic inflammatory disease, enlargement of the gestational sac and fetal heartbeat.[29] In our study, we treated all scar pregnancies with systemic methotrexate, and 9 patients underwent vacuum curettage for complete removal of chorionic tissue.

Ovarian Pregnancy

OvP is an uncommon occurrence, with frequency estimates ranging from 1 in 2100 pregnancies to 1 in 7000 pregnancies or 3% of all EPs. Ultrasonographic findings for OvP include a large echogenic ring, yolk sac or fetal fragments that are more echogenic on the ovary compared to the ovarian tissue. Surgical criteria as defined by Spiegelberg: fallopian tubes are intact and separate from the ovary, the GS in the ovary is attached to the uterus via the utero-ovarian ligament, and placental tissue appears mixed with the ovarian cortex. Surgical treatment is the most common approach and oophorectomy or wedge resection of the ovary is generally necessary.[32] In ovarian pregnancies, some studies suggest that surgery is more successful than systemic methotrexate treatment.[25] When surgery is required to preserve fertility, wedge resection rather than oophorectomy seems to be more valuable and there are studies including subsequent pregnancy outcomes.[33] The study of Reis et al.[26] showed that surgery was performed in all ovarian pregnancies detected. In our study, 5 patients were treated with partial resection and 3 with systemic methotrexate to preserve ovarian reserve.

Limitations

The main limitations of this research are the limited sample sizes owing to the rarity of the condition and the variation in therapies on the basis of clinical particular characteristics and in order to individualize the appropriate care.

CONCLUSION

It emerges from our sample that NT-EP needs to be diagnosed quickly. This may aid a conservative management with a medicinal or least invasive approach. The significant advance in imaging technologies allows for a more rapid diagnosis, allowing the patient to be transferred to a reference center where the best procedures can be selected, reducing the impact of surgery on the patient's fertility. For NT-EP management, a reference center with surgeons well trained in minimally invasive surgery with specific skills that reduce the risks of life-threatening bleeding and hysterectomy and preserve future fertility is essential.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was set up with the permission of Erzincan Binali Yıldırım University clinical research ethics committee (Date: 04.07.2024, Decision No: 369119).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

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REFERENCES

1. Bouyer J, Coste J, Shojaei T, et al. Risk factors for ectopic pregnancy: a comprehensive analysis based on a large case-control, population-based study in France. *Am J Epidemiol*. 2003;157(3):185-94. doi:10.1093/aje/kwf190
2. Di Lorenzo G, Romano F, Mirenda G, et al. "Nerve-sparing" laparoscopic treatment of parametrial ectopic pregnancy. *Fertility Sterility*. 2021;116(4):1197-1199.
3. Bouyer J, Coste J, Fernandez H, Pouly J-L, Job-Spira N. Sites of ectopic pregnancy: a 10 year population-based study of 1800 cases. *Human reproduction*. 2002;17(12):3224-3230.
4. Rana P, Kazmi I, Singh R, et al. Ectopic pregnancy: a review. *Archives Gynecol Obstet*. 2013;288:747-757.
5. Alkatout I, Honemeyer U, Strauss A, et al. Clinical diagnosis and treatment of ectopic pregnancy. *Obstet Gynecol Survey*. 2013;68(8):571-581.
6. Casanova BC, Sammel MD, Chittams J, Timbers K, Kulp JL, Barnhart KT. Prediction of outcome in women with symptomatic first-trimester pregnancy: focus on intrauterine rather than ectopic gestation. *J Women's Health*. 2009; 18(2):195-200.
7. Feng C, Chen ZY, Zhang J, Xu H, Zhang XM, Huang XF. Clinical utility of serum reproductive hormones for the early diagnosis of ectopic pregnancy in the first trimester. *J Obstet Gynaecol Res*. 2013;39(2):528-535.
8. Lau S, Tulandi T. Conservative medical and surgical management of interstitial ectopic pregnancy. *Fertility Sterility*. 1999;72(2):207-215.
9. Rotas MA, Haberman S, Levgur M. Cesarean scar ectopic pregnancies: etiology, diagnosis, and management. *Obstet Gynecol*. 2006;107(6):1373-1381.
10. Morin L, Cargill YM, Glanc P. RETIRED: ultrasound evaluation of first trimester complications of pregnancy. *J Obstet Gynaecol Canada*. 2016;38(10): 982-988.
11. Barnhart KT, Guo W, Cary MS, et al. Differences in serum human chorionic gonadotropin rise in early pregnancy by race and value at presentation. *Obstet Gynecol*. 2016;128(3):504-511.
12. Dimitry ES, Subak-Sharpe R, Mills M, Margara R, Winston R. Nine cases of heterotopic pregnancies in 4 years of in vitro fertilization. *Fertility sterility*. 1990;53(1):107-110.
13. 13.Jurkovic D, Bourne TH, Jauniaux E, Campbell S, Collins WP. Transvaginal color Doppler study of blood flow in ectopic pregnancies. *Fertility sterility*. 1992;57(1):68-73.
14. Tas EE, Akcay GFY, Avsar AF. Single-dose methotrexate for the treatment of ectopic pregnancy: our experience from 2010 to 2015. *Pakistan J Med Sci*. 2017;33(1):13.
15. Barnhart KT, Gosman G, Ashby R, Sammel M. The medical management of ectopic pregnancy: a meta-analysis comparing "single dose" and "multidose" regimens. *Obstet Gynecol*. 2003;101(4):778-784.
16. Takacs P, Chakhtoura N. Laparotomy to laparoscopy: changing trends in the surgical management of ectopic pregnancy in a tertiary care teaching hospital. *J Minimally Invasive Gynecol*. 2006;13(3):175-177.

17. Chetty M, Elson J. Treating non-tubal ectopic pregnancy. *Best Practice Res Clin Obstet Gynaecol*. 2009;23(4):529-538.

18. Oliver R, Malik M, Coker A, Morris J. Management of extra-tubal and rare ectopic pregnancies: case series and review of current literature. *Archives Gynecol Obstet*. 2007;276:125-131.

19. Gomel V. From laparotomy to laparoscopy to in vitro fertilization. *Fertility Sterility*. 2019;112(2):183-196.

20. Taylor JE, Yalcinkaya TM, Akar ME. Successful conservative management of cervical ectopic pregnancy: a case series. *Archives Gynecol Obstet*. 2011;283: 1215-1217.

21. Stabile G, Mangino FP, Romano F, Zinicola G, Ricci G. Ectopic cervical pregnancy: treatment route. *Medicina*. 2020;56(6):293.

22. Fowler ML, Wang D, Chia V, et al. Management of cervical ectopic pregnancies: a scoping review. *Obstet Gynecol*. 2021;138(1):33-41.

23. Tremmel E, Starrach T, Buschmann C, et al. Management of non-tubal ectopic pregnancies analysis of a large tertiary center case series. *Archives Gynecol Obstet*. 2024;309(4):1227-1236.

24. Di Tizio L, Spina M, Gustapane S, D'Antonio F, Liberati M. Interstitial pregnancy: from medical to surgical approach—report of three cases. *Case Rep Obstet Gynecol*. 2018;2018(1):2815871.

25. Ramkrishna J, Kan G, Reidy KL, Ang WC, Palma-Dias R. Comparison of management regimens following ultrasound diagnosis of nontubal ectopic pregnancies: a retrospective cohort study. *BJOG: Inter J Obstet Gynaecol*. 2018; 125(5):567-575.

26. Akdaş Reis Y, Akay A, Özkan M, et al. Non-tubal ectopic pregnancy treatment experiences of a tertiary care center. *Archives Gynecol Obstet*. 2024: 1-9.

27. Mao S, Dai Y, Zhu L, Sun Z, Lang J. Clinical analysis of surgical treatment of cornual pregnancy of 109 cases. *Zhonghua fu Chan ke za zhi*. 2021;56(11):782-787.

28. Maheux-Lacroix S, Li F, Bujold E, Nesbitt-Hawes E, Deans R, Abbott J. Cesarean scar pregnancies: a systematic review of treatment options. *J Minimally İnvasive Gynecol*. 2017;24(6):915-925.

29. Hu Y, Shen L, Fu J, Huang W. Interventions for non-tubal ectopic pregnancy. *Cochrane Database of Systematic Reviews*. 2020;(7)

30. Miller R, Timor-Tritsch IE, Gyamfi-Bannerman C, Medicine SfM-F. Society for Maternal-Fetal Medicine (SMFM) consult series# 49: cesarean scar pregnancy. *Am J Obstet Gynecol*. 2020;222(5):B2-B14.

31. Altay MM, Mert SA, Gemici A, Kaplan M, Gelisen O. Successful technique of manual vacuum aspiration for treatment of type 2 cesarean scar pregnancies: evaluation of 40 cases. *J Maternal-Fetal Neonatal Med*. 2021;34(16):2693-2700.

32. Kraemer B, Kraemer E, Guengoer E, et al. Ovarian ectopic pregnancy: diagnosis, treatment, correlation to Carnegie stage 16 and review based on a clinical case. *Fertility sterility*. 2009;92(1):392. e13-392. e15.

33. Seinera P, Di Gregorio A, Arisio R, Decko A, Crana F. Ovarian pregnancy and operative laparoscopy: report of eight cases. *Human Reproduction (Oxford, England)*. 1997;12(3):608-610.

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Review

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The effect of pilates and yoga during pregnancy on birth outcomes: traditional review

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ABSTRACT

Regular exercise during pregnancy has been reported to have positive effects on birth outcomes. The World Health Organization (WHO) and the American College of Obstetrics and Gynecology (ACOG) state that pregnant women should perform at least 150 minutes of moderate intensity aerobic exercise per week. Pilates and Yoga exercises are frequently preferred exercises during pregnancy. Pilates is an exercise model based on the integrity of mind and body. Pilates exercises are one of the most preferred exercises for pregnant women to improve their psychological and physical functions. Pilates exercises during pregnancy have been reported to decrease the rate of perineal injury, the rate of episiotomy application, the duration of labor and pain perception in labor, while increasing the rate of vaginal delivery and postpartum satisfaction level. It is also reported to improve neonatal Apgar score. Yoga is one of the most preferred exercises to improve maternal-fetal health and perinatal outcomes during pregnancy. Yoga is a traditional exercise method based on the unity of body, mind and spirit with breathing techniques and asanas. Yoga exercises during pregnancy have been reported to decrease the rate of vaginal delivery, use of induction of labor, analgesia requirement, preterm delivery rate, degree of episiotomy rupture, duration of labor and pain perception, while increasing the level of Apgar score of the newborn, birth weight of the newborn and postpartum comfort level. More evidence-based studies examining the effect of Pilates and yoga exercises on birth outcomes are needed in the literature. The aim of this review is to examine the results of studies conducted to determine the effect of pilates and yoga exercises during pregnancy on birth outcomes.

Keywords: Birth, pregnancy, pilates, yoga

INTRODUCTION

Pregnancy is a period in which many physical and psychological changes are experienced in women's lives.[1] Many symptoms are observed due to physical and psychological changes during pregnancy.[2] The symptoms experienced during pregnancy and lack of information about exercise cause physical inactivity in pregnant women.[3] Regular physical activity and exercise during pregnancy reduce the risk of postpartum depression and increase quality of life.[4,5]

The World Health Organization (WHO) and the American College of Obstetric and Gynecology (ACOG) suggest that sedentary time should be reduced for pregnant women and at least 150 minutes of moderate intensity aerobic physical activity per week is required.[6,7] According to ACOG, exercise during pregnancy reduces back pain, constipation, risk of gestational diabetes, preeclampsia and cesarean delivery rate.[8] Different types of exercises such as yoga, pregnancy gymnastics, Pilates and kegel exercises are performed during pregnancy. Pilates exercise in pregnancy is recommended by ACOG.[8] Pilates is recognized as an important exercise to improve physical, psychological and motor functions.[9] Pelvic floor exercises are a part of modern pilates.[9] It has been reported that regular exercise strengthens the pelvic floor muscles and increases their structural function.[7]

One of the exercises frequently preferred by pregnant women is pregnancy yoga.[10] Yoga contributes to both physical and psychological health, improves muscle strength, memory, sleep quality, and reduces pain and depression.[11] Yoga practiced during pregnancy enables pregnant women to contact their minds, bodies, spirits and fetuses.[12] It has been reported that yoga exercises during pregnancy reduce anxiety, depression, back and pelvic pain, and reduce labor pain during delivery.[13,14]

In the literature, there are experimental studies examining the effect of yoga and pilates exercises during pregnancy on birth outcomes. Although there are separate review studies examining the effect of yoga[3,10,13] and pilates exercises[15-17] on

birth outcomes during pregnancy, there is no study in which pilates and yoga exercises are examined together. The aim of this review is to examine the results of studies conducted to determine the effect of Pilates and yoga exercises during pregnancy on birth outcomes.

PILATES EXERCISE IN PREGNANCY

Pilates is an exercise model based on mind and body integrity.[15] Pilates was initially called the "science of control" and later expressed as the integration of mind, body and power coordination.[15] Pilates is based on six movement principles. These are; concentration, control, precision, fluidity of movement, breath and activation of the power center.[18] Pilates combines strength training and general stretching through exercises. Pilates method is known to have benefits such as muscle strength gain, flexibility, coordination, proprioceptin, trunk and pelvic stability and postural improvement for healthy and non-healthy adults.[18] Given the holistic benefits of pilates, its application during pregnancy has attracted attention as a potential method to address the various physical and mental challenges women face during this period.

Pregnancy causes many anatomical, physiologic and mental changes in women.[16] Pregnant women experience physical symptoms such as low back pain, pelvic pain and edema due to changes in the musculoskeletal system.[19] Women who cannot adapt to physical changes during pregnancy experience depression and the fetus is negatively affected.[20] Recently, pilates exercise has been reported to be safe for pregnant women, but it has also been suggested that it may stimulate the abdominal and pelvic muscles.[21] Pilates exercises cause contraction of the deep abdominal muscles, so pilates exercises in pregnant women needs to be individualized.[22] Since implementation of exercise programs that do not take into account individual characteristics and pregnancy status may adversely affect the mother or fetus, the opinions of universal organizations regarding exercise programs in pregnancy are important for safe guidelines. In this context, in the committee opinion of ACOG, pilates exercise is actively recommended for pregnant women.[8]

Considering that pilates is a type of resistance training, it has been reported to alleviate musculoskeletal symptoms that occur during pregnancy, such as pelvic floor dysfunction[23] and diastasis rectus abdominis[24] and to help women physically prepare for delivery and reduce their fear of labor.[17] Although clinical guidelines recommend modified pilates as an appropriate form of pregnancy exercise,[25] there is little objective data showing that pilates is safe or improves birth outcomes, but it has been reported to have no side effects in both low- and high-risk pregnant women.[26, 27]

THE EFFECT OF PILATES EXERCISE DURING PREGNANCY ON BIRTH AND NEONATAL OUTCOMES

Pilates exercises during pregnancy are one of the most important exercises to improve the psychological and physical functioning of pregnant women.[26] Exercises performed to strengthen the abdominal muscles and pelvic floor during pregnancy facilitate natural delivery by reducing pain and making the pelvic ligaments flexible during labor.[28] In 2021, in a quasi-experimental study conducted to examine the effect of pilates exercises on pelvic floor injuries during pregnancy, women in the experimental group were given one hour of pilates exercise twice a week for 4 weeks. According to the results of the study, it was reported that women who practiced pilates exercise had lower perineal injury rates.[29] Aktan et al.[15] (2021), in a study conducted to examine the effect of pilates exercises during pregnancy on birth outcomes, women in the intervention group were exercised 2 days a week for 8 weeks and as a result of the study, it was reported that women felt less pain during labor and Apgar scores of newborns were better. In 2021, in a randomized controlled clinical trial to study the effectiveness of a pilates exercise program during pregnancy on birth outcomes, primiparous women between 26 and 28 weeks of gestation in the intervention group performed pilates exercises for 8 weeks. The results of the study showed that pilates exercise during pregnancy significantly reduced the intensity of labor pain, the length of the active phase and the duration of the second stage of labor and increased maternal satisfaction. No difference was found in terms of episiotomy, mode of delivery, and first and fifth Apgar scores of newborns.[30] In another study conducted to investigate the effect of pilates exercises during pregnancy on birth outcomes and neonatal health, it was reported that the rate of episiotomy and vacuum application was low, the rate of normal delivery and Apgar scores at the 1st minute and 5th minute in newborns were high in women who performed pilates exercises during pregnancy.[31] In a meta-analysis (n=719) study conducted by Zaman[32] (2023) to examine the obstetric, maternal and neonatal outcomes of pilates exercise during pregnancy, it was reported that women who performed pilates exercise during pregnancy were more likely to have vaginal delivery and the duration of labor was shorter.

YOGA EXERCISE IN PREGNANCY

In ancient Indian science, yoga was defined as a lifestyle that includes changes in mental attitude and diet as well as the application of certain techniques.[3] Yoga is a traditional exercise method based on the unity of body, mind and spirit together with breathing techniques and asanas.[14] Although there are many types and styles of yoga, typical yoga practices combine stretching and holding asanas with deep, rhythmic breathing and meditation to increase flexibility and strength. Although Kundalini yoga, Iyengar yoga, Vinyasa yoga and Prenatal yoga are widely used, Hatha yoga is the most preferred type of yoga in western culture.[33] Evidence suggests that Prenatal yoga is safe, feasible and acceptable for pregnant women.[34]

Although yoga exercise during pregnancy is generally a safe exercise method, it has been reported to be risky in hot weather.[36] It is recommended that women should not perform yoga exercises in hot weather because of the increased risk of pregnancy-related injuries.[35]

Prenatal yoga has been reported to have positive effects on stress, anxiety, depression, self-efficacy, duration and mode of labor by increasing the level of physical activity.[34] As a result of increased self-efficacy during pregnancy, women tend to remain calmer throughout labor, which allows them to better manage both the physical and emotional challenges of childbirth. This heightened sense of control not only contributes to more effective pain management but also enhances their ability to actively participate in the labor process and make informed decisions, leading to a more positive birth experience.[36]

THE EFFECT OF YOGA EXERCISE DURING PREGNANCY ON BIRTH AND NEONATAL OUTCOMES

Yoga is one of the exercises used to improve maternal-fetal health and perinatal outcomes in pregnancy.[12] Yoga is accepted as a safe and harmless exercise in pregnancy.[34] Prenatal yoga is known to reduce stress, anxiety and depression and has positive effects on birth outcomes.[12] Prenatal yoga increases the strength and flexibility of key muscle groups involved in the labor process such as the back, waist and pelvic floor muscles.[37] In addition, yoga exercise has an effect on the endocrine and nervous systems during pregnancy, which alleviates stress and negative emotions.[37] In a randomized controlled study examining the effect of prenatal yoga exercises on labor pain and birth outcomes, it was reported that women who practiced prenatal yoga had less need for labor induction, analgesia, and the number of low birth weight babies, a higher rate of vaginal delivery and postpartum comfort level, and a shorter duration of labor.[38] In 2021, in another randomized controlled study examining the effect of integrated yoga performed during pregnancy on birth outcomes, it was reported that the rate of preterm birth and preeclampsia was lower in women who practiced yoga, and the Apgar scores and birth weights of newborns were higher.[39]

Prenatal yoga exercises have been used in many studies investigating the effects of prenatal yoga exercises on the birth process and neonatal outcomes. Rong et al.[40] (2021), in a randomized controlled study on Chinese primiparous women to evaluate the effect of prenatal yoga on birth outcomes, the intervention group was given yoga exercise for 12 weeks. As a result of the study, it was reported that the rate of vaginal delivery was higher and the duration of the 1st, 2nd and 3rd stages of labor was shortened. In 2021, in a clinical study conducted in Iran to determine the effect of yoga on labor and neonatal outcomes in nulliparous pregnant women, the intervention group was given Hatha Yoga exercise twice a week between the 26th and 37th weeks. As a result of the study, it was reported that the rate of natural delivery was higher in women who practiced yoga, episiotomy was applied to pregnant women during delivery, but the degree of episiotomy rupture was less (1 and 0), the birth weights of the babies were higher, and the 1st and 5th minute Apgar scores were higher.[41]

There are many studies examining the positive effects of prenatal yoga exercises on birth outcomes. Rong et al.[42] (2020), in a meta-analysis study in which 7 studies (n=808) were examined to determine the effect of prenatal yoga on birth outcomes, it was reported that prenatal yoga decreased the rate of preterm birth and birth weight of the newborn, shortened the delivery time and increased the rate of vaginal birth. In 2022, in another meta-analysis (n=2217) study in which 29 studies were examined to examine the effect of prenatal yoga on birth outcomes, it was reported that yoga performed during pregnancy decreased anxiety and depression, shortened the delivery time and increased the vaginal birth rate.[34]

Studies examining the effects of prenatal yoga exercises on labour duration and labour pain are also included in the literature. Riawati et al.[43] (2021), in a meta-analysis study in which 9 studies were examined to determine the effect of prenatal yoga on labor duration and labor pain, it was reported that yoga shortened labor duration and decreased the pain score at birth. In 2023, in another meta-analysis study in which 5 studies (n=581) were examined to evaluate the effectiveness of prenatal yoga on labor pain, it was reported that prenatal yoga reduced labor pain.[44]

RECOMMENDATIONS FOR PILATES AND YOGA EXERCISES IN PREGNANCY

Yoga and pilates are safe and effective exercise models to support both physical and mental health in pregnancy. However, it is of great importance that these exercises are planned with the right timing, appropriate frequency and individualized.

1. **Start Time:** It is recommended to start pilates and yoga exercises from the 12th week of pregnancy. Since attention should be paid to the adaptation process of the body in the first trimester, intense exercises should be avoided before this period.[8]
2. **Frequency:** Pregnant women are recommended to do pilates and yoga exercises at least 2-3 times a week, with sessions lasting 30-60 minutes. This frequency is ideal to prevent overstraining while increasing muscle strength and flexibility.[8]
3. **Types of Exercise:** Pilates and yoga are among the exercises that can facilitate the birth process during pregnancy, especially as they strengthen the abdominal and pelvic floor muscles. However, the exercises must be given by experienced instructors and adapted to the physical characteristics of each individual.[8]
4. **Who Should it Be Recommended to?:** Pilates and yoga are recommended for women with low-risk pregnancies. In high-risk pregnancies or in women who have experienced complications in previous pregnancies, physician approval should be obtained before starting these exercises.[8]
5. **Considerations:** During pilates and yoga, excessive stretching or forceful movements should be avoided and attention should be paid to any pain or discomfort that may occur in the body. In addition, exercise programmes should be individualised, as each woman's pregnancy status is different.[8]
6. **Universal Recommendations**: Universal organisations such as the ACOG state that pilates and yoga exercises in pregnancy are safe and that regular exercise is beneficial for both mother and baby. These organisations recommend that exercises should be guided by a health professional and planned according to individual characteristics.[8]

CONCLUSION

Pilates and yoga exercises performed during pregnancy have been reported to reduce the rate of perineal injury, episiotomy application rate, induction of labor, analgesia requirement, duration of labor and pain perception in labor, while improving neonatal Apgar score and increasing the level of postpartum comfort. It is recommended by universal organizations that pilates and yoga exercises should be planned according to individual needs and performed under the expert guidance. In addition, starting exercises in the second trimester of pregnancy may provide more favorable effects on birth outcomes. With a multidisciplinary approach, the

co-operation of health professionals will support the safe and effective implementation of exercises.

ETHICAL DECLARATIONS

Referee Evaluation Process

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Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Jiang Q, Wu Z, Zhou L, Dunlop J, Chen P. Effects of yoga intervention during pregnancy: a review for current status. *Am J Perinatol.* 2014:503-514. doi:10.1055/s-0034-1396701
2. Jarvis S, Nelson-Piercy C. Common symptoms and signs during pregnancy. *Obstet Gynaecol Reprod Med.* 2020;30(10):321-325. doi:10.1016/j.ogrm.2020.07.005
3. Balaji P, Varne SR. Physiological effects of yoga asanas and pranayama on metabolic parameters, maternal, and fetal outcome in gestational diabetes. *Natl J Physiol Pharm Pharmacol.* 2017;7(7):724. doi:10.5455/njppp.2017.7.0306713032017
4. Liu N, Gou W-H, Wang J, Chen D-D, Sun W-J, Guo P-P, et al. Effects of exercise on pregnant women's quality of life: A systematic review. *Eur J Obstet Gynecol Reprod Biol.* 2019;242:170-177. doi:10.1016/j.ejogrb.2019.03.009
5. Nakamura A, van der Waerden J, Melchior M, Bolze C, El-Khoury F, Pryor L. Physical activity during pregnancy and postpartum depression: systematic review and meta-analysis. *J Affect Disord.* 2019;246:29-41. doi:10.1016/j.jad.2018.12.009
6. Jarvis S, Nelson-Piercy C. Common symptoms and signs during pregnancy. *Obstet Gynaecol Reprod Med.* 2020;30(10):321-325. doi:10.1016/j.ogrm.2020.07.005
7. Sitzberger C, Hansl J, Felberbaum R, Brössner A, Oberhoffer-Fritz R, Wacker-Gussmann A. Physical activity in high-risk pregnancies. *J Clin Med.* 2022;11(3):703. doi:10.3390/jcm11030703
8. American College of Obstetric and Gynecology (ACOG). Physical activity and exercise during pregnancy and the postpartum period. Available at: https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2020/04/physical-activity-and-exercise-during-pregnancy-and-the-postpartum-period No:804. Accessed July 25, 2023.
9. Bø K, Herbert RD. There is not yet strong evidence that exercise regimens other than pelvic floor muscle training can reduce stress urinary incontinence in women: a systematic review. *J Physiother.* 2013;59(3):159-168. doi:10.1016/S1836-9553(13)70180-2
10. Linda I, Lubis R, Siregar Y. The effectiveness of physical exercise, prenatal yoga and pregnancy gymnastics in Primigravida on childbirth duration. *Heal Notions.* 2017;1(2):113-117.
11. Kwon R, Kasper K, London S, Haas DM. A systematic review: the effects of yoga on pregnancy. *Eur J Obstet Gynecol Reprod Biol.* 2020;250:171-177. doi:10.1016/j.ejogrb.2020.03.044
12. Chen P-J, Yang L, Chou C-C, Li C-C, Chang Y-C, Liaw J-J. Effects of prenatal yoga on women's stress and immune function across pregnancy: a randomized controlled trial. *Complement Ther Med.* 2017;31:109-117. doi:10.1016/j.ctim.2017.03.003
13. Jahdi F, Sheikhan F, Haghani H, et al. Yoga during pregnancy: the effects on labor pain and delivery outcomes (A randomized controlled trial). *Complement Ther Clin Pract.* 2017;27:1-4. doi:10.1016/j.ctcp.2016.12.002
14. Ostrovsky DA. Yoga in the third trimester may reduce labor pain, duration of labor, and risk of cesarean section. *Explore (NY).* 2018;14(2):163-164. doi:10.1016/j.explore.2017.12.003
15. Aktan B, Kayıkçıoğlu F, Akbayrak T. The comparison of the effects of clinical pilates exercises with and without childbirth training on pregnancy and birth results. *Int J Clin Pract.* 2021;75(10). doi:10.1111/ijcp.14516
16. Dastenaei BM, Aein F, Safdari F, Karimiankakolaki Z. Designing an intervention program over the effects of Pilates on pregnancy outcomes among pregnant women: a protocol study. *Int J Surg Protocols.* 2020;24:27-30. doi:10.1016/j.isjp.2020.10.004
17. Dias NT, Ferreira LR, Fernandes MG, Resende APM, Pereira-Baldon VS. A Pilates exercise program with pelvic floor muscle contraction: is it effective for pregnant women? A randomized controlled trial. *Neurourol Urodyn.* 2018;37(1):379-384. doi:10.1002/nau.23308
18. Isacowitz R. Pilates: Human Kinetics; 2022.
19. Santos-Rocha R, Branco M, Aguiar L, Vieira F, Veloso AP. Biomechanical adaptations of gait in pregnancy: implications for physical activity and exercise. In: exercise and sporting activity during pregnancy: evidence-based guidelines. 2019:95-134.
20. Coll CdVN, Domingues MR, Stein A, et al. Efficacy of regular exercise during pregnancy on the prevention of postpartum depression: the PAMELA randomized clinical trial. *JAMA Netw Open.* 2019;2(1). doi:10.1001/jamanetworkopen.2018.6861
21. Hyun A, Cho J. Effects of 12-week Pilates mat exercise on body composition, delivery confidence, and neck disability index in pregnant women. *Sports Sci.* 2019;36:43-55.
22. Sonmezer E, Özköslü MA, Yosmaoğlu HB. The effects of clinical Pilates exercises on functional disability, pain, quality of life and lumbopelvic stabilization in pregnant women with low back pain: a randomized controlled study. *J Back Musculoskelet Rehabil.* 2021;34(1):69-76. https://10.3233/BMR-191810
23. Mazzarino M, Kerr D, Morris ME. Pilates program design and health benefits for pregnant women: a practitioners' survey. *J Bodyw Mov Ther.* 2018;22(2):411-417. doi:10.1016/j.jbmt.2017.05.015
24. Sarpkaya Güder D, Yalvaç M, Vural G. The effect of pregnancy Pilates-assisted childbirth preparation training on childbirth fear and neonatal outcomes: a quasi-experimental/quantitative research. *Qual Quant.* 2018;52:2667-2679.doi:10.1007/s11135-018-0682-0
25. Kader M, Naim-Shuchana S. Physical activity and exercise during pregnancy. *Eur J Physiother.* 2014;16(1):2-9. doi:10.3109/21679169.2013.861509
26. de Souza Ferraz V, Peixoto C, Resstel APF, de Paula YTC, de Souza Pegorare ABG. Effect of the Pilates method on pain and quality of life in pregnancy: a systematic review and meta-analysis. *J Bodyw Mov Ther.* 2023;35:220-227.doi:10.1016/j.jbmt.2023.04.076
27. Mazzarino M, Morris ME, Kerr D. Pilates for low risk pregnant women: study protocol for a randomized controlled trial. *J Bodyw Mov Ther.* 2021;25:240-247.doi:10.1016/j.jbmt.2020.12.015
28. Rodríguez-Díaz L, Ruiz-Frutos C, Vázquez-Lara JM, Ramírez-Rodrigo J, Villaverde-Gutiérrez C, Torres-Luque G. Effectiveness of a physical activity programme based on the Pilates method in pregnancy and labour. *Enfermería Clínica (English Edition).* 2017;27(5):271-277.doi:10.1016/j.enfcle.2017.05.007
29. Feria-Ramírez C, Gonzalez-Sanz JD, Molina-Luque R, Molina-Recio G. The effects of the Pilates method on pelvic floor injuries during pregnancy and childbirth: a quasi-experimental study. *Int J Environ Res Public Health.* 2021;18(13):6995. doi:10.3390/ijerph18136995
30. Ghandali NY, Iravani M, Habibi A, Cheraghian B. The effectiveness of a Pilates exercise program during pregnancy on childbirth outcomes: a randomized controlled clinical trial. *BMC Pregnancy Childbirth.* 2021;21(1):1-11.
31. Kirici P, Nacar MC, Karaçor T, et al. Pilates workouts can improve the labor and newborn outcomes: a case control study. *J Surg Med.* 2021;5(6):642-647. doi:10.28982/josam.951898
32. Zaman AY. Obstetric, maternal, and neonatal outcomes after Pilates exercise during pregnancy: a systematic review and meta-analysis. *Medicine.* 2023;102(21): e33688-e. doi:10.1097/MD.0000000000033688
33. Brosnan P, Nauphal M, Tompson MC. Acceptability and feasibility of the online delivery of hatha yoga: a systematic review of the literature. *Complement Ther Med.* 2021;60:102742. doi:10.1016/j.ctim.2021.102742
34. Corrigan L, Moran P, McGrath N, Eustace-Cook J, Daly D. The characteristics and effectiveness of pregnancy yoga interventions: a systematic review and meta-analysis. *BMC Pregnancy Childbirth.* 2022;22(1):1-21.
35. Mooventhan A. A comprehensive review on scientific evidence-based effects (including adverse effects) of yoga for normal and high-risk pregnancy-related health problems. J Bodyw Mov Ther. 2019;23(4):721-727.doi:10.1016/j.jbmt.2019.03.005
36. Campbell V, Nolan M. 'It definitely made a difference': a grounded theory study of yoga for pregnancy and women's self-efficacy for labour. *Midwifery.* 2019; 68: 74-83. doi:10.1016/j.midw.2018.10.005

37. Chuntharapat S, Petpichetchian W, Hatthakit U. Yoga during pregnancy: effects on maternal comfort, labor pain, and birth outcomes. *Complement Ther Clin Pract*. 2008;14(2):105-115. doi:10.1016/j.ctcp.2007.12.007

38. Bolanthakodi C, Raghunandan C, Saili A, Mondal S, Saxena P. Prenatal yoga: effects on alleviation of labor pain and birth outcomes. *J Altern Complement Med*. 2018;24(12):1181-1188.. doi:10.1089/acm.2018.0079

39. Pais M, Pai MV, Kamath A, Bhat R, Bhat P, Joisa GH. A randomized controlled trial on the efficacy of integrated yoga on pregnancy outcome. *Holist Nurs Pract*. 2021;35(5):273-280. doi:10.1097/HNP.0000000000000472

40. Rong L, Wang R, Ouyang Y-Q, Redding SR. Efficacy of yoga on physiological and psychological discomforts and delivery outcomes in Chinese primiparas. *Complement Ther Clin Pract*. 2021;44:101434. doi:10.1016/j.ctcp.2021.101434

41. Yekefallah L, Namdar P, Dehghankar L, Golestaneh F, Taheri S, Mohammadkhaniha F. The effect of yoga on the delivery and neonatal outcomes in nulliparous pregnant women in Iran: a clinical trial study. *BMC Pregnancy Childbirth*. 2021;21(1):351.doi:10.1186/s12884-021-03794-6

42. Rong L, Dai LJ, Ouyang YQ. The effectiveness of prenatal yoga on delivery outcomes: a meta-analysis. *Complement Ther Clin Pract*. 2020;39:101157 doi:10.1016/j.ctcp.2020.101157

43. Riawati MS, Budihastuti UR, Prasetya H. The effect of prenatal yoga on birth labor duration and pain: a meta-analysis. *J Matern Child Health*. 2021; 6(3):327-337. doi:10.26911/thejmch.- 2021.06.03.07

44. Zhang L, Wang S. The efficacy of prenatal yoga on labor pain: a systematic review and meta-analysis. *Altern Ther Health Med*. 2023;29(5):121-125.

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Case Report

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Ectopic pregnancy with unicornuate uterus and renal agenesis

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ABSTRACT

Müllerian anomaly is a common congenital developmental disorder in women. Ectopic pregnancy is also one of the gynecological emergencies observed in women of reproductive age. The co-occurrence of these two conditions is quite rare. Among Müllerian anomalies, the unicornuate uterus is often difficult to diagnose due to its generally asymptomatic nature. Women with a unicornuate uterus have fertility levels similar to those in the general population. Developmental defects can be observed together due to the relationship between Müllerian development and mesonephric ducts. This case aims to highlight Müllerian anomaly and renal agenesis observed in conjunction with ectopic pregnancy.

Keywords: Müllerian anomaly; ectopic pregnancy; renal agenesis

INTRODUCTION

Müllerian canal anomalies occur in the general population at a rate of 0.5% to 6.7%. In women with recurrent miscarriages, the reported frequency can be as high as 16.7%. It is estimated that the actual prevalence is higher than the diagnosed cases. The most common clinical presentations include primary amenorrhea, dysmenorrhea, pelvic pain, endometriosis, sexual difficulties, and low self-esteem. Diagnostic methods include two-dimensional and three-dimensional ultrasound, MRI, hysterosalpingography, hysteroscopy, and laparoscopy.[1] Pregnancy rates in women with uterine anomalies are not significantly different from those with a normal uterus .The coexistence of Müllerian anomalies and ectopic pregnancy is not a common occurrence. In a study conducted among infertile women, the incidence of ectopic pregnancy in those with a unicornuate uterus was reported as 4%.[2]

We present as a case report the incidentally observed müllerian anomaly and renal agenesis in a patient who was operated on due to ectopic pregnancy.

CASE PRESENTATION

A 31-year-old female patient presented to our clinic with complaints of delayed menstruation and vaginal bleeding. Transvaginal ultrasound imaging did not reveal a gestational sac in the endometrial cavity.The patient had a history of one abortion and five parity. She had no known surgical history other than a cesarean section. On ultrasound, the left ovary could not be clearly assessed, but a suspicious focus was observed in the right ovary and minimal fluid in the Douglas pouch. The sequential β-HCG results suggested an ectopic pregnancy due to a plateau pattern. The patient's β-HCG levels measured one day apart were observed to be 4975 ıU/ml and 5102 ıU/ml. After the curettage, no decrease in the β-HCG level was observed, and it was reported as 4781 ıU/ml. The patient's vital signs were stable, with positive abdominal guarding and negative rebound tenderness. Laparoscopic surgery was recommended to the patient. She requested tubal ligation. The patient was selected for surgery based on a collaborative decision regarding the treatment. After obtaining informed consent and completing the necessary preparations, the patient was taken to the operating room.

During laparoscopic exploration, it was found that the patient had no left fallopian tube or left ovarian ligament, and the uterus was deviated to the right, with the left ovary fixed to the left abdominal wall. The patient, who had only previously undergone a cesarean section, had minimal intra-abdominal adhesions. It was also noted that the patient did not have a left kidney.

The ectopic focus in the right tube was excised using Ligasure. After controlling for bleeding, the procedure was concluded. The hemoglobin level was 11.3 g/dL before the operation and decreased to 9.1g/dL afterwards.

An magnetic resonance (MR) imaging has been requested to further detail the patient's developmental anomalies. Postoperatively, the patient underwent MR imaging, and the images are as follows. It has been showed by MR imaging that the patient has no left kidney and left lig.ovariproprium (Figure 1 A,B). The patient's left ovary was observed to be deflated to the left abdominal wall (Figure 1 C).

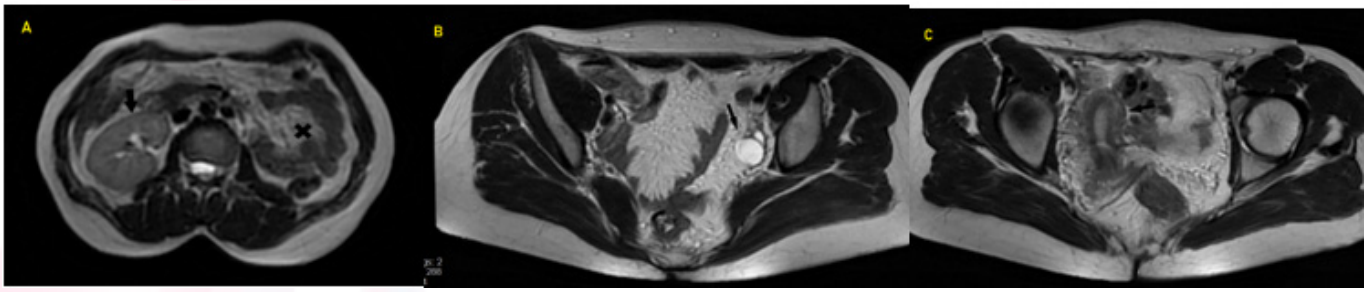

Figure 1. Arrow there is a right kidney but the left kidney is not visible (**A**), Arrow The left ovary is adjacent to the iliac crest and has no connection with the uterus (**B**), Arrow uterus deviated to the right (**C**)

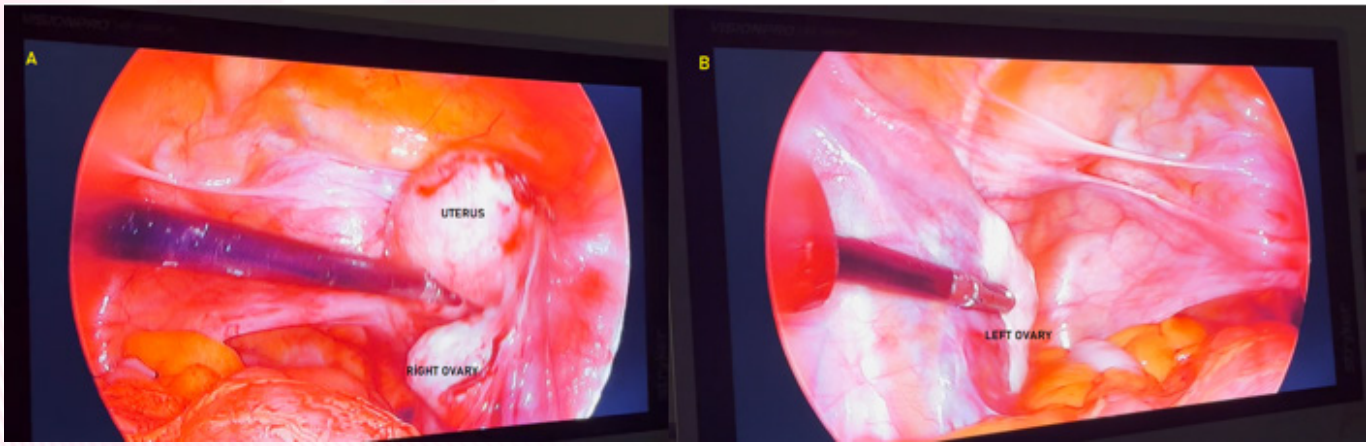

Figure 2. Right ovary and relation of uterus (**A**), Left ovary without uteroovarian ligament (**B**)

Intraoperative images were similar to the MR findings The left ovary is observed fixed to the abdominal wall and the left uteroovarian ligament cannot be observed (Figure 2 A,B).

A written consent was obtained from the patient.

DISCUSSION

In a study conducted among women of reproductive age, the frequency of Müllerian anomalies was noted to be 7%. This figure is not realistic due to the presence of asymptomatic patients.[3] The coexistence of Müllerian anomalies with renal system anomalies is quite common, with over 30% of renal anomalies occurring alongside Müllerian anomalies.[4]

Ectopic pregnancy has an incidence of 5-10% and is one of the conditions that increase maternal mortality in the first trimester. Patients often present with symptoms such as delayed menstruation and vaginal bleeding.[5]

The coexistence of ectopic pregnancy and Müllerian anomalies is not common, and there is limited data available in the literature on this topic; thus, the exact prevalence is not well established.

According to The American Society for Reproductive Medicine's (ASRM) 2021 classification, unicornuate uterus is classified as left/right unicornuate uterus, with distal atrophic uterine remnant, with distal uterine remnant functional endometrium, associated atrophic uterine remnant and uterine horn communicating at level of cervix.[6]

In our case, a right unicornuate uterus was observed, along with left renal agenesis.

In a study involving infertile women, the prevalence of Müllerian anomalies was found to be 4.4%. Among Müllerian anomalies, the septate uterus is reported as the most common form. The two most frequently observed forms of Müllerian anomalies associated with pregnancies in infertile patients are septate uterus and unicornuate uterus, respectively.[7]

In a case similar to ours, a Müllerian anomaly complicated by ectopic pregnancy accompanied by right renal agenesis has been reported.[8]

In the literature review, there are cases of unicornuate uterus and ectopic pregnancy, but no similar study was found regarding the case of unicornuate uterus and renal agenesis together with ectopic pregnancy.[9]

CONCLUSION

This case shows us that not every Müllerian anomaly affects fertility. It is not always possible to detect Müllerian anomaly. Müllerian anomaly may be encountered in gynecological emergencies such as ectopic pregnancy and surgery. Renal anomalies may also accompany Müllerian anomalies due to their similar developmental origin. In this case, we aimed to draw attention to the fact that we may encounter incidental types of müllerian anomalies in patients presenting with ectopic pregnancy.

ETHICAL DECLARATIONS

Informed Consent

All patients signed a free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. e Passos, I D M P, Britto, RL. (2020). Diagnosis and treatment of müllerian malformations. *Taiwanese J Obstet Gynecol. 59*(2):183-188.
2. Al-Bdairi, A.A.H., Al-Hindy, et al., Impact of congenital uterine anomalies on ectopic pregnancy: a cross-sectional observational study of 510 cases. *Med J Babylon.* 2024. 21(Suppl 1):p.S52-S57.
3. O'Flynn, O, Bhatia V, Homafar M. et al. The prevalence of Müllerian anomalies in women with a diagnosed renal anomaly. *J Pediatr Adolescent Gynecol.* 2020;34(2): p. 154-160.
4. Friedman MA, Aguilar L, Heyward Q, Wheeler C, Caldamone A. Screening for Mullerian anomalies in patients with unilateral renal agenesis: leveraging early detection to prevent complications. *J Pediatr Urol.* 2018;14(2):p.144-149.
5. Mullany K, Minneci M, Monjazeb RC, Coiado O. Overview of ectopic pregnancy diagnosis, management, and innovation. *Women's Health.* 2023;19: p. 17455057231160349.
6. Pfeifer SM, Attaran M, Goldstein J, et al. ASRM müllerian anomalies classification. *Fertility and sterility.* 2021;116(5): p.1238-1252.
7. Reyes-Muñoz E, Vitale SG, Alvarado-Rosales D, et al. Müllerian anomalies prevalence diagnosed by hysteroscopy and laparoscopy in mexican infertile women: results from a cohort study. *Diagnostics.* 2019;9(4): p.149.
8. Brahmbhatt S, Makhija A, Brahmbhatt J, Patel YV. Ectopic pregnancy in a case of congenital mullerian anomaly: a diagnostic dilemma. *Int J Rep, Contraception, Obstet Gynecol.* 2020;9(8): p.3512-3515.
9. Woolnough B, Ballermann C. (2019). An atypical presentation of ectopic pregnancy with unicornuate uterus and undescended fallopian tube. *J Obstet Gynaecol Canada. 41*(2):214-216.

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