ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/nurses.2022-92844

Hospital Process of Children with Ingested Corrosive Substances: A Single Center Retrospective Study in Türkiye

Korozif Madde Alan Çocukların Hastane Süreci: Türkiye'de Tek Merkezli Retrospektif Çalışma

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ABSTRACT Objective: This study retrospectively was aimed to determine how the treatment and care processes of children ingestion corrosive substances are maintained. **Material and Methods:** The population of the study is children with ingested corrosive substances, and the sample consisted of pediatric patients who ingestion corrosive substances from the pediatric surgery department of a university hospital in western Türkiye. Medical and nursing files of children with corrosive substance ingestion from the university's electronic patient file were examined. The sample of the study consisted of 70 pediatric patients who came between the years 2018-2021. The analysis of data was calculated using SPSS 24.0 program, frequency, percentage, median, interquartile range, comparison analysis and logistic regression. **Results:** The median age at first admission of pediatric patients was 4.0 years and 57.1% were girls. 35.7% of the pediatric patients due to oil consumption, 30.0% of them applied to the pediatric surgery department in the summer season, and the hospital was not the first application center for 61.4%. According to the Rush Medicus Patient Classification System, 40% of the children were defined as low-level dependent patients. The first arrival age of children affects the level of nursing dependency. It was determined that the rate of dilatation in pediatric patients varied according to the hospital first application center. **Conclusion:** As a result, although the dependency level of the children taking corrosive substances to the nurse is low, it was determined that the child's first admission age and dilatation status affect the level of addiction.

Keywords: Corrosive ingestion; pediatric surgery; retrospective study; treatment; nursing

ÖZET Amaç: Bu çalışma, korozif madde alan çocukların tedavi ve bakım süreçlerinin nasıl sürdürüldüğünü belirlemek amacıyla retrospektif olarak yapıldı. **Gereç ve Yöntemler:** Araştırmanın evreni korozif madde alan çocuklar, örneklemi Türkiye'nin batısında bir üniversite hastanesinin çocuk cerrahisi bölümüne gelen korozif madde alan çocuk hastalardır. Üniversitenin elektronik hasta dosyasından korozif madde alan çocukların tıbbi ve hemşirelik dosyaları incelendi. Araştırmanın örneklemini 2018-2021 yılları arasında gelen 70 çocuk hasta oluşturmuştur. Verilerin analizi SPSS 24.0 programı, frekans, yüzde, medyan, çeyrekler arası aralık, karşılaştırma analizi ve lojistik regresyon kullanılarak hesaplanmıştır. **Bulgular:** Pediatrik hastaların ilk başvuru yaş medyanı 4,00 yıl olup, %57,1'i kızdır. Pediatrik hastaların %35,7'si yağ çöz alımı nedeniyle, %30'u yaz mevsiminde çocuk cerrahisi bölümüne başvurmuş ve %61,4'ü hastane ilk başvuru merkezi olmamıştır. Rush Medicus Hasta Sınıflandırma Sistemine göre çocukların %40'ı düşük düzeyde bağımlı hastalar olarak tanımlandı. Çocukların hastaneye ilk geliş yaşı hemşirelik bağımlılık düzeyini etkilemektedir. Pediatrik hastalardaki dilatasyon oranının hastanenin ilk başvuru merkezine göre farklılık gösterdiği belirlendi. **Sonuç:** Sonuç olarak korozif madde alan çocukların hemşireye bağımlılık düzeyi düşük olmasına rağmen çocuğun ilk başvuru yaşı ve dilatasyon durumunun bağımlılık düzeyini etkilediği belirlendi.

Anahtar Kelimeler: Korozif madde alma; pediatrik cerrahi; retrospektif çalışma; tedavi; hemşirelik

Corrosive ingestion can cause temporary or permanent damage depending on the etiology and degree of the injury. Harmful substances can be ingested intentionally or unintentionally, with unintentional ingested usually seen in children.[1-4] Among the main causes of corrosive substance ingestion in children, there are children's curiosity, male gender children, children with attention deficit-hyperactivity disorder, parents with low educational status, children with young mothers, children without parent

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Peer review under responsibility of Turkiye Klinikleri Journal of Nursing Sciences.

Received: 09 Aug 2022 ***Received in revised form:*** 12 Oct 2022 ***Accepted:*** 19 Oct 2022 ***Available online:*** 31 Oct 2022

supervision, children residing in rural areas.[3,4] According to the 2020 annual report of the National Poison Data System of the American Association of Poison Control Centers, the most common ingestions in children aged 5 years and younger are cosmetics/personal care products such as perfume, cologne, shower gel and soap (11.8%), household cleaners (11.3%), analgesic drugs (7.57%), foreign objects/toys/various substances such as batterie (6.71%), and dietary supplements/plants (6.44%). The highest corrosive substance ingestion rates are 6,780 per 100,000 population for one-year-olds and 6,398 per 100,000 population for two-year-old.[5] In Türkiye, National Poison Information Center received a total of 334,441 calls in 2020 and provided consultancy to 187,528 cases. Considering the distribution by months, it was determined that children aged 0-5 were injured the most in February, March and July. It is reported that 53.7% of children under the age of five are exposed to products harmful to human health, 22.87% to household chemicals, 8.09% to cosmetic chemicals, 5.51% to industrial chemicals and 3.77% to agricultural chemicals.[6] In the studies, corrosive substance ingestion is seen especially in summer and outside the home due to increased exposure to corrosive substances, and parents take their children to the emergency room.[3,4,7-9]

Corrosive substances can cause partial or complete necrosis and sometimes perforation of the esophagus, and as such, patients may have a damaged esophagus for life and possible swallowing problems.[1-4,10-12] Damage varies according to the pH of the corrosive substance consumed. Alkaline substances cause liquefaction necrosis resulting in serious injuries from the mouth to the stomach, especially the esophagus. Acids, on the other hand, produce superficial injuries by causing coagulation necrosis and have less of an effect on the esophagus as they are neutralized by saliva. However, due to low viscosity, acids pass into the stomach faster and can combine with stomach acids causing serious injuries to all areas of the stomach, especially the antrum and pylorus.[1-4,8-12]

Harm to the esophagus occurs immediately after ingestion of a corrosive substance. This damage begins to heal after about 10 days and approximately one month later, epithelialization tissue begins to form in the damaged areas of the esophagus. During this process, it is important to monitor patients at regular intervals for complications such as stricture.[1-4,8,9,11-13] Therefore, patient follow-up varies in the acute and chronic phases. In the acute phase, treatment is mostly conservative, except for local and systemic complications. Strictures develop in approximately 13.5% of patients and endoscopic and other major surgeries are used for treatment.[11,12]

Although there is no gold standard treatment for esophageal strictures, the primary treatment is endoscopic dilatations. The stricture may recur after initial dilatation, but typically starts to decrease over time.[12-16] Various treatment modalities such as steroid injection, mitomycin C administration or esophageal stenting are recommended in the literature to increase the efficiency of endoscopic dilatations.[17-20] However, dilatation may fail in severe esophageal strictures.[11,15-20] Major surgical treatment is then required, i.e., performing esophageal replacement surgeries using the stomach, jejunum or colon.[15] The organ to be chosen for replacement varies depending on the patient's esophagus and stomach surgeries, the degree of corrosive injury and the competence of the institution.[11,14] Patients with ingested corrosive esophageal are very difficult to treat, regardless of the cause of the injury, especially children who develop esophageal strictures, since the treatment and care process take many years, the quality of life of the children decreases, a feeling of guilt develops in the parents and the burden of care increases.[2,3,20-22]

Depending on the ingestion of corrosive substances, the duration of hospitalization can be shortened by planning, applying and evaluating the results of individualized nursing care in the period until the discharge of pediatric patients admitted to the pediatric surgery service for treatment and care and their parents.[23,24] Nursing care should be planned and recorded in order to ensure the continuity of nursing care, improve the quality of care and manage care.[24] Unfortunately, the literature on childhood corrosive substance ingestion in our country and in the world is limited, and there are many deficiencies in nursing care and diagnosis. Yörükoğlu and Bal Yılmaz found that the quality of life of children with ingestion cor-

rosive substances is low and that the quality of life reported by mothers and children reported is similar, Faron et al. found that the physical and mental quality of life was low, and Özer Özlü and Vural found that the care burden of the parents of children who ingested corrosive substances was high.[21,22,25] Apart from these studies, there are retrospective studies on clinical approaches.[4,11,26]

For this reason, patient classification systems can be used to provide appropriate support to children and their parents with ingestion corrosive substances, to plan appropriate interventions, and to evaluate the results of interventions. It is a method that is sensitive to the individual characteristics of patients with patient classification systems, grouping the care needs of children and parents according to the severity of their disease and the amount of care given to patients. There are many types of patient classification systems, from simple to complex, including nursing care hours and personal time. Some of these are the Oulu Patient Classification, the RAFAELA System, the Perroca Patient Classification Instrument, the Nursing Aktivities Score, The Therapeutic Intervention Scoring System, the Professional Assessment of Optimal Nursing Care Intensity Level, the Rush Medicus Patient Classification System, and the Cheltenham Patient Classification Scale. In Türkiye, Rush Medicus Patient Classification System, Cheltenham Patient Classification Scale, Treatment Interventions Scoring System and Nursing Interventions Scoring System are mostly used in the field of application.[27]

Determining the dependency-independence status of children and parents guides the nurse in planning nursing care. Considering the fact that addicted individuals need more nursing care, determining the level of care dependency is very important in managing and improving the quality of care. Nursing care planned for dependent and independent patients differs, and there are also differences in the expectations of patients. Therefore, the level of addiction can also affect the evaluation of nursing care.[28]

Examining the hospital processes of children taking corrosive substances can be a guide for nurses working in this field. Because it is an ongoing health problem today and the presence of various surgical treatments in the treatment process affects both nurses, parents and children. Nurses knowing the treatment process of children ingesting corrosive substances and providing appropriate care will facilitate the management of care. This study retrospectively was aimed to determine how the treatment and care processes of children ingestion corrosive substances are maintained.

MATERIAL AND METHODS

TYPE OF RESEARCH

This study, which was aim to determine how the treatment and care processes of children ingestion of corrosive substances, is a retrospective descriptive study.

UNIVERSE AND SAMPLE OF THE RESEARCH

The population of the study consisted of pediatric patients with corrosive substance ingestion. The sample of the study consisted of 70 pediatric patients who received corrosive substances, who applied to the pediatric surgery department of a university hospital in western Türkiye between the years 2018-2021. The pediatric surgery department in this hospital has been transferred to the electronic patient file since 2018, and nursing care is also provided through this system.

DATA COLLECTION

Data were collected via form for demographic and clinical characteristics of children with ingestion corrosive substances and Rush Medicus Patient Classification System scores. Rush Medicus Patient Classification System is used as the patient classification system in the hospital where the study was conducted. Data were taken from electronic patient file records. However, in the evaluation of patients according to the level of dependency according to the Rush Medicus Patient Classification System score, only 20 patients' data were available.

Form for Demographic and Clinical Characteristics of Children with Ingestion Corrosive Substances: While examining the files, the characteristics of other retrospective studies were examined and a 20-item data collection form created by the re-

searchers was used.[1-4,10-30] In this form, questions about the child's age, gender, type of corrosive substance, status of the hospital as the first application center, hospital admission season, status of esophageal dilatation, status of mitomycin C administration, status of intralesional steroid administration, status of application major surgery, status of receiving antacid-antireflux, status of nutrition and repeated visits to the hospital.

Rush Medicus Patient Classification System: This scale was developed by Middleton and Lumby (1998) in 1972 to evaluate the relationship between the nurse workforce and the quality of patient care.[31] In Rush Medicus Patient Classification System, the care needs of the patients are evaluated according to 29 care areas and the level of dependence of the patients is determined according to the scores obtained in total. Each parameter was scored according to the patient's level of dependency on the nurse. The lowest is 2 points, the highest is 24 points. By following the definitions of care in the application table for each patient, the appropriate care definition scores are marked for the patient, and the total score of each patient is determined. According to their addiction levels, patients were classified as independent patients (Type 1: 0-24 points), low-level dependent patients (Type 2: 25-48 points), moderately addicted patients (Type 3: 49-120 points) and high-level dependent patients (Types 3: 49-120 points). Type 4: 121 points and above) are divided into four groups.[32-34]

EVALUATION OF DATA

SPSS for Windows, Version 24.0 (IBM Corp.; Armonk, NY, USA) program was used to analyze the data. Percentages and numbers for categorical descriptive demographic and clinical data, median and interquartile range [IQR] for continuous descriptive data were calculated from the data collection form. The conformity of the variables to the normal distribution was determined by applying Kolmogorov-Smirnov, Shapiro-Wilk normality tests, kurtosis and skewness coefficient values, and Q-Q plot graph. It was determined that the data did not conform to the normal distribution. The Kruskal-Wallis Test was performed to find out whether the level of nurse dependence and the child's age at first arrival were affected. Binary logistic regression analysis was performed to determine the dilatation status according to the first application site. For binary logistic regression, enter model was first applied and when non-significant independent variables were determined in enter models, backwards: Wald model was used. Probability values less than 0.05 were considered statistically significant.

ETHICS OF RESEARCH

This study was approved by the department of pediatric surgery (date: March 1, 2021, no: E-36653857-010.99-67458) and the Medical Research Ethics Committee of Ege University (date: April 1, 2021, no: 21-4T/53). The requirement for signed, informed consent was waived because of the retrospective aspect of the study and the use of de-identified data. Details of the study were published on an institutional website, and individuals were provided the right to decline participation. The study was performed in accordance with the principles of the Declaration of Helsinki and the ethical guidelines for medical and health research involving human subjects.

RESULTS

DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF CHILDREN WITH CORROSIVE INGESTION

In our study, a total of 70 children's files (40 girls, 30 boys) were evaluated retrospectively. The median age of the children was 8.00 [IQR 10.00], and the median age at first admission was 4.00 [IQR 4.00]. Of the pediatric patients, 35.7% drank oil solution, 61.4% did not have the same hospital as the first application site, 68.6% underwent esophageal dilatation, 32.9% received mitomycin C, 24.3% received intralesional steroid injection, 27.1% received major. It was determined that surgery was performed, 63.1% of those who underwent major surgery had esophageal replacement, 65.7% received antacid-antireflux treatment, 34.3% received additional nutritional product supplements, and 77.1% came to the hospital repeatedly. It was determined that the season of admission to the hospital due to corrosive substance ingestion of the children was summer and the median month of arrival is the sixth month. It was de-

termined that 82.9% of the pediatric patients continued peroral feeding. The level of dependency on the nurse was determined to be low-level dependent patients in 40.0% of the pediatric patients. Other findings related to descriptive demographic and clinical characteristics are listed in Table 1.

COMPARISON OF RUSH MEDICUS PATIENT CLASSIFICATION SYSTEM BY CHILD'S AGE AT FIRST ADMISSION

There was a statistically significant difference between the Rush Medicus Patient Classification System and the age at first admission of the pediatric patient ($p<0.05$). It was determined that independent pediatric patients had a higher age at first admission (Table 2).

BINARY LOGISTIC REGRESSION ANALYSIS TO THE EFFECT OF DILATATION APPLICATION BY THE FIRST APPLICATION CENTER

Binary logistic regression was performed to determine whether the dilatation application had an effect on the first application center. The regression model that emerged as a result of the analysis was found to be significant. Estimates 28% of the variance in dilation practice in pediatric patients relative to the first application centre. The incidence of dilatation is 8,970 times higher in pediatric patients whose initial hospital application center is different. As a result, the hospital where the children with high dilatation status come from is not the first application center. This situation can be interpreted as follows. After ingestion of corrosive substances, parents take their children to more than one hospital. This, in turn, causes delay in the treatment of children and, accordingly, an increase in esophageal stenosis and an increase in the need for dilatation (Table 3).

DISCUSSION

Ingestion of corrosive substances still remains a more important problem for our country. The majority of children ingesting corrosive substances are girls and preschool children. It is similar to other studies on corrosive substance ingestion.[1-4,7-9] It can be said that the fine motor development of children in this age period of continue and their curiosity to explore their

TABLE 1: Demographic and clinical characteristics of children with corrosive ingestion.

Variables	n	%	M [IQR]
Current age of the child	70		8.00 [10.00]
Child's first admission age	70		4.00 [4.00]
Gender			
Female	40	57.1	
Male	30	42.9	
Type of substance			
Oil solvent	25	35.7	
Rust remover	12	17.1	
Drain opener	8	11.4	
Spirit of salt	2	2.9	
Bleach	2	2.9	
Vinegar spirit-pickle	2	2.9	
Other (battery, wart medicine, etc.)	19	27.1	
pH value of substance			
Acidic	51	72.9	
Alkaline (basic)	19	27.1	
Hospital's first application center			
Yes	27	38.6	
No	43	61.4	
Hospital admission season			
Spring	17	24.3	
Summer	21	30.0	
Autumn	16	22.9	
Winter	16	22.9	
Hospital application month	70		6.00 [5.25]
Esophageal dilatation status			
Yes	48	68.6	
No	22	31.4	
Mitomycin C administration status			
Yes	23	32.9	
No	47	67.1	
Intralesional steroid administration status			
Yes	17	24.3	
No	53	75.7	
Major surgery application status			
Yes	19	27.1	
No	51	72.9	
Type of major surgery applied			
Esophageal replacement	12	63.1	
Stoma surgery for nutritional purposes	4	21.05	
Nissen fundoplication	2	10.5	
Other	1	5.26	
Status of receiving antacid-antireflux treatment			
Yes	46	65.7	
No	24	34.3	
Status of receiving nutritional supplements			
Yes	24	34.3	
No	46	65.7	
Nutritional status			
Peroral	58	82.9	
Enteral	12	17.1	
Repeated visits to the hospital			
Yes	54	77.1	
No	16	22.9	
Rush Medicus Patient Classification System calculation status			
Yes	20	28.6	
No	50	71.4	
Rush Medicus Patient Classification System			
Independent patient	7	35	
Low level dependent patient	8	40	
Intermediate dependent patient	4	20	
Senior dependent patient	1	5	

n: Simple absolute frequency; M: Median; IQR: Interquartile range.

TABLE 2: Comparison of Rush Medicus Patient Classification System by child's age at first admission.

Variable	Rush Medicus Patient Classification System	n	Mean rank
Child's first admission age	Independent patient	7	13.13
	Low level dependent patient	8	12.81
	Intermediate dependent patient	4	3.38
	Senior dependent patient	1	2.00
	TOTAL	20	100

TABLE 3: Binary logistic regression analysis to determine the effect of dilation application by the first application center.

							95% confidence interval for Exp (β)	
Variable	β	Standart error	Wald	df	p value	Exp (β)	Low	High
Esophageal dilatation status (1)	2.194	0.589	13.866	1	0.000	8.970	2.827	28.462
Constant	-1.819	0.440	17.085	1	0.040	0.162		

Nagelkerke R^2=0.285, Omnibus Chi-square=15.895, df=1, p=0.000, Hosmer ve Lemeshow=p<0.000

environment increases the risk of corrosive swallowing injury.[35] Children especially tend to touch the objects around them and taste the things they are curious about. When considering injuries by gender, some studies have found that boys are more affected than girls.[3,8,29] However, in a retrospective study of 125 patients who were followed up with the diagnosis of corrosive substance ingestion and in a study conducted on the demographic, epidemiological and clinical characteristics of poisoning cases followed in the pediatric intensive care unit, it was found that girls were injured more than boys.[4,10] Although the rate of injury was higher in girls in this study, it is thought that corrosive substance intake does not differ according to gender.

It was seen that the majority of children applied to the hospital in the summer months and the majority of the hospital application centers were not the first. These injuries, which are more common domestic accidents in children, require rapid diagnosis and immediate treatment, and this is consistent with the literature.[7,29] Children's ingestion of corrosive substances mostly in summer is similar to the studies conducted.[4,7] The easy accessibility of cleaning materials used in cleaning, especially in summer months, and increased exposure to toxic substances outside the home may be among the important reasons. In our study, it was determined that the majority of children with ingested corrosive substances came to the hospital repeatedly. This is due to the fact that children's first admission hospitals are different places and there are delays in the treatment and care process due to the child's ingestion of corrosive substances. According to the wound healing mechanism, it can be interpreted that these children come to the hospital repeatedly because esophageal stricture occurs.

In our study, it was found that dilatation, Mitomycin C, intralesional steroid and major surgery were used in the treatment of children. Although there is no gold standard treatment for abrasive ingestion in the literature, dilatation is recommended as the first treatment.[10-12] Mitomycin C and intralesional steroid administration are recommended to increase dilatation efficiency.[14-19] In the study of Divarci et al., steroid and mitomycin C applications in the treatment of esophageal strictures were found to have a positive effect on resistant strictures.[18,19] However, steroids were found to be effective only in short segment esophageal strictures and not in the long segment.[18] On the other hand, they found that the efficacy of mitomycin C was low in children treated for three years or longer.[19] A meta-analysis of steroid therapy compared the number and duration of dilatations in steroid-treated patients; this treatment has been found to prolong the time between dilatations in resistant esophageal strictures.[17] Additionally, in our study, it was found that the difference in the first admission hospital of the pediatric patient affected the dilatations. This may have caused a delay in the treatment process because the child's parent was in search of a hospital. Considering the study findings,

it was seen that most of the children received antacid-antireflux treatment in addition to endoscopic surgical methods and were fed orally after ingestion of corrosive substances. These results show that oral nutrition is maintained as a result of various treatment protocols for children.

In our study, it was determined that the children whose Rush Medicus Patient Classification System level was calculated were mostly low-level dependent patients. In addition, it was found that the age of children at first admission to the hospital affects the Rush Medicus Patient Classification System level score. This situation changes the differences in the developmental stages of the children according to their age characteristics and their dependence on their parents. For this reason, the fact that the child, who is more dependent on his/her parents, has higher care needs, suggests that nursing care needs may also increase. In general, it was determined that nurses mostly used monitoring, incontinence care, vital signs monitoring at two-hour intervals, special emotional support, intravenous interventions, feeding with a feeding tube, tube care, partial wound skin care for these patients.[32-34] Considering the nursing interventions for addiction levels, they focused mostly on health perception and health management, nutrition and metabolic status, elimination and cognitive-perceptual functional health patterns. It has been noticed that the child's activity, the role and relations of the parent, safety, comfort and growth and development are not emphasized. In line with these results suggest that pediatric patients have low need for intensive care, but both the child and the parent need support in their care. In the studies, it has been determined that the parents of these children have a high care burden and they need support in the care of the child.[21,22] Even if the dependency level of the children on the nurse is low, the level of dependency of the parents on the nurse should be reduced first in order to ensure that the children become an independent patient. Because the parents of these patients may have a high sense of guilt, it makes us think that they will increase their dependence on the nurse during hospitalizations.

The biggest limitation of this study is that only 20 of 70 children reached the Rush Medicus Patient Classification System levels when examining electronic nursing files. However, despite this small number of it is thought that these results will be valuable for developing countries such as our country, since there is no similar study on nursing and clinical results of children in retrospective studies on this subject in the literature. In our study, it was tried to emphasize both the treatment process and the care needs of these children and their parents.

CONCLUSION

In conclusion, this study showed that corrosive substance ingestion continues in children in our country as in other developing countries. Esophageal dilatation due to stenosis that develops after ingestion of corrosive substances results in long-term treatment and outpatient follow-up and re-hospitalization. It shows that pediatric patients and their parents need nurses. This vitally important issue, which is ignored especially for parents, affects all family processes.[21-23] It may be beneficial for these parents to organize support group meetings during the treatment process, to provide information about the treatment processes and related factors, to listen to their problems and to offer solutions. In addition, since it is more common in children between the ages of one and five, parents with children in this age group should be informed about the intake and treatment of abrasive substances. By raising awareness in the society, the intake of corrosive substances can be prevented. It is recommended that multi-centre and multi-disciplinary team work be carried out in order to determine the care needs of children with ingestion corrosive substances for the future and to establish care protocols that will meet these needs.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Nazife Gamze Özer Özlü, Fatma Vural;* ***Design:*** *Nazife Gamze Özer Özlü, Fatma Vural;* ***Control/Supervision:*** *Fatma Vural, Ülküm Zafer Dökümcü;* ***Data Collection and/or Processing:*** *Nazife Gamze Özer Özlü;* ***Analysis and/or Interpretation:*** *Nazife Gamze Özer Özlü, Fatma Vural, Ülküm Zafer Dökümcü;* ***Literature Review:*** *Nazife Gamze Özer Özlü;* ***Writing the Article:*** *Nazife Gamze Özer Özlü;* ***Critical Review:*** *Fatma Vural, Ülküm Zafer Dökümcü;* ***References and Fundings:*** *Nazife Gamze Özer Özlü.*

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