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Effects of Face-to-Face Education on Reduction Noise in Hemodialysis Units: A Quasi-Experimental Study

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Abstract

Objective
This study aims to evaluate the effect of the education given to the hemodialysis personnel on noise and noise management in the hemodialysis unit on the level of noise exposure of hemodialysis patients. Another aim of the study is to determine whether hemodialysis patients are affected by noise in the hemodialysis unit.

Material and Method
This quasi-experimental study was conducted at two dialysis centers in Turkey between January and May 2022, with 101 hemodialysis patients (80%) and 50 hemodialysis unit employees (90%). Noise level measurements were made before and two weeks after the noise control education was given to the staff.

Results
In the study, before the face-to-face education, 62% of employees stated that the noisy environment sometimes distracted them, 92% had not participated in an education on noise, and 82% wanted to receive education on this subject. After the education, it was observed that the noise level decreased on all days and hours. The average of the measurements made for a total of five days after the education decreased statistically significantly compared to the pre-education period ($p<0.05$).

Conclusion
Our study showed that the noise levels in hemodialysis units are disturbing for patients, the knowledge and awareness of the personnel on the subject is low, education programs including noise prevention and reduction strategies increase the knowledge and awareness of the personnel and rapidly turn into behaviors, and education is effective in noise control.

Keywords: Face-to-face education, hemodialysis, noise, quasi-experimental study

Introduction

Environmental awareness has grown dramatically over the last two decades. Noise pollution, in addition to water and air pollution, is a significant public health issue (1,2). The effects of noise spread quickly and become more apparent as noise level increase. Noise; is a significant environmental health issue that produces a variety of illnesses based on its intensity (3,4).

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Noise-induced problems include stress response in the organism, depression, insomnia, concentration disorder, immune system weakness, anxiety, loss of appetite, hearing loss, delayed wound healing, decreased pain threshold, and deterioration in physiological parameters (3,5). While the exposure of healthy individuals to noise can cause these health problems, the exposure of patients undergoing treatment due to other health problems in hospitals is a much more important issue (6, 7). Noise in hospitals causes additional health problems for patients and negatively affects the healing process (8-11).

The standard noise intensity is 40 decibels (dB) during the day and 35 dB at night (12). Noise is defined as an unwanted and unexpected sound perceived by the ear without rhythm or harmony that causes psychosocial and physiological stress in the individual (13,14). According to the World Health Organization, the noise level in hospitals should not exceed 35 dB during the day and 30 dB at night (15). Meanwhile, the Environmental Protection Association guidelines suggest that noise levels should not exceed 45dB(A) during the day and 35dB(A) at night (16, 17). However, measurements taken in hospitals in recent years show that the noise levels are approximately 72 dB during the day and 60 dB at night (15-17).

Noise pollution in hospitals affects not only the patients but also the staff working in the hospital (18-20). Intensive care units, surgical services, and dialysis units are among the main places in hospitals where noise pollution is experienced owing to a large number of mechanical devices and the alarms they trigger (6, 21).

Noise is a significant problem for patients and staff in dialysis units (10). In these units, telephone calls, staff conversations, and; most importantly, hemodialysis machines can increase the sound intensity in these environments (10). Dialysis patients face many challenges due to chronic kidney failure. In addition, dialysis treatment for these patients is a lifelong process, often involving 4 hours a day 2-3 days a week (22). For patients who spend most of their lives in a dialysis unit, good environmental conditions also determine their health (23, 24). In addition, the number of studies that show how high the noise levels are in dialysis units and what the causes of the noise are in our country is very limited.

Therefore, it is very important to determine the level sources of noise in dialysis units and to control the noise exposure. The most effective way to change behavior in a subject is education. An important part of noise control is the education of nurses, doctors, and other staff working in the dialysis unit to deal with noise sources. Raising awareness is the first step in the fight against noise sources. Noise pollution can be combated through education, according to the literature. Based on this, this study aims to evaluate the effect of the education given to the hemodialysis personnel on noise and noise management in the hemodialysis unit on the level of noise exposure of hemodialysis patients. Another aim of the study is to determine whether hemodialysis patients are affected by noise in the hemodialysis unit.

Material and Method

Study Design and Sample

This quasi-experimental study was conducted at two dialysis centers in Turkey between January 2022 and May 2022. The inclusion criteria were individuals who have received hemodialysis treatment for at least three months, are 18 years of age and older, have a place, time, and person orientation, are literate, have no communication barriers, and agree to participate in the study. Patients with hearing problems and patients who did not volunteer to participate in the study were excluded from the study. The study was conducted with 101 (80%) hemodialysis patients and 50 (90%) hemodialysis unit employees.

Instruments

Patient Characteristics Form

This form, which was prepared by the researchers in line with the literature, includes 10 questions, including 6 questions about the sociodemographic (age, gender, marital status, etc.) characteristics of the patients and 4 questions about the disease and treatment process.

Noise Level Assessment Form

The first part of this form, which consists of two parts, there is a numerical scale (between 0-10) questioning the level of patients' discomfort with noise in the hemodialysis unit. Patients are asked to select the number that best describes the noise intensity they perceive. A level of zero indicates that the patients perceive no noise at all, while the highest number means that they perceive a very high level of noise. In the second part of this form, there are 25 statements prepared by the researchers in line with the literature, which enable the patients to evaluate their level of discomfort from various noise sources in the hemodialysis unit on a five-point Likert scale: None: 1, Somewhat: 2, Moderate: 3, High: 4, Very, High: 5. (9,10,15,18). In this form, the opinions of three expert faculty members working in nephrology in the field of internal medicine nursing and a scientific expert

nephrology nurse were taken into consideration. Using the Davis Technique, the content validity index was calculated as 0.96.

Employees Characteristics Form
This form, which was prepared by the researchers in line with the literature, consists of a total of 13 questions, including four questions about the sociodemographic (age, gender, marital status, etc.) characteristics of the employees, three questions about professional information, three questions about noise awareness in the hemodialysis unit and three questions about the level of noise disturbance.

Noise Measurement
The noise was measured using a Uni-t Ut353 Mini decibelmeter. UT350 series sound level meters can measure sound noise level and output results in dB. Depending on the application, A or C-weighted modes can be selected. These meters consume very little power and can operate continuously for up to 20 hours. They are suitable for industrial and environmental sound level measurements. At the end of each hourly measurement, the noise meters were calibrated by the researcher with the Cem Sc-05 (Sound Level Calibrator) calibration device between 94 and 114 dB as specified in the instructions, by placing the microphones at the end of the device near to the end of the calibration device, and by using two different sound intensities.

Procedure
The patient introduction form and the Noise level assessment form were applied face-to-face by the researcher to the patients who were hospitalized in the hemodialysis unit and met the research criteria. This form took approximately eight minutes to fill out. In addition, the introduction form was applied face-to-face by the researcher to the employees in the unit. It took three minutes for the employees to fill out the form. It took a total of three weeks to collect these data from patients and employees. At the end of these three weeks, the employees of the hemodialysis unit consisting of nurses, physicians, dialysis technicians, medical secretaries, and cleaning staff were divided into groups of five people so as not to disrupt the services provided in the unit and each group was given a total of 40 minutes of noise control education. The educations were conducted by the researcher in the meeting room in the hemodialysis unit and completed in two weeks.

Educational Intervention
A structured educational program was designed in the form of knowledge in noise control. This educational program has been created with a systematic approach to cover the multifaceted aspects of auditory management and aims to provide an in-depth understanding of both the theoretical principles and practical applications related to the control of environmental acoustics. It was constructed by the researchers after conducting and reviewing related literature literature (8, 9, 12, 16, 17, 19). The group teaching techniques and a PowerPoint presentation consisting of 30 slides containing visual and scientific information were used. The principal investigator (HC), performed the teaching intervention. The education lasted a total of 40 minutes in the form of discussion, question, and answer. The group education was didactic and interactive. Participants could ask questions at the time of class. An interactive portion of the teaching program was held at the end of class. In this section, personnel were encouraged to offer support to each other. The content of the education included the concept of noise, noise sources in hemodialysis units, ensuring noise awareness in hospital staff, the effects of noise on patients and hospital staff, noise reduction strategies in hemodialysis units, and evidence-based practices in reducing noise in hemodialysis units. In addition, at the end of the education, all participants were given materials in the form of written brochures containing the information explained. These brochures were also left at the hemodialysis unit. Two weeks after the education of all employees was completed, the noise level assessment form was applied to the patients for the second time.

Noise level measurements were made before and two weeks after the noise control education was given to the staff. Since the two hemodialysis centers where the study was conducted had similar physical characteristics, noise level measurements were performed in the same way. In both centers, the unit consisted of a total of 10 beds, and the nurse observation desk was located in the middle. The noise-measuring device was placed in the center of the unit. Noise sources and levels were evaluated in a 10-station hemodialysis unit over five days, covering a period of 4 times per day.

Statistical Analysis
The data obtained in the research were analyzed using SPSS (Statistical Package for Social Sciences) for the Windows 25.0 program. Descriptive statistical analyses (number, percentage, mean, standard deviation) were performed while evaluating the data. Normal distribution fit was checked with normality tests and kurtosis and skewness values. It was determined that the data met the assumption of normal distribution. In this case, the dependent sample t-test was used to

compare the average noise disturbance levels of the patients before and after the education given to the employees.

Results

The mean age of the patients who participated in the study was 57.20 ± 9.18 years and the majority (62.4%) were male. Other descriptive characteristics of the patients are given in Table 1.

The mean age of the hemodialysis unit employees who participated in the study was 32.56 ± 5.743 years, 54% were male and 44% were dialysis technicians. Other descriptive characteristics of the employees are given in Table 2.

When the noise level assessment form in which the patients who participated in the study indicated the noise sources and the degree of discomfort they were disturbed by during the hemodialysis session was evaluated, the mean score given by the patients to the noise scale between 0-10 was 7±9.23 and the level of discomfort from noise was evaluated as 5±4.18 by the patients after the education given to the employees. The answers given to the questions related to noise sources and discomfort level in the second part of the noise level assessment form are given in detail in Table 3.

When the staff participating in the study were asked about their opinions on noise in the hemodialysis unit before the education, 80% of the employees stated that the unit was noisy, 62% stated that the noisy environment sometimes distracted them, 92% stated that they had not participated in an education on noise and 82% stated that they would like to receive education on this subject (Table 4).

Noise measurement values before and after the education given to the personnel are given in Table 5. According to Table 5, it is seen that the noise level decreased after the education on all days and hours, and the noise level was the highest at noon.

The relationship between the averages of the noise measurement values before and after the education given to the personnel is given in Table 6. It is seen that the average of the measurements made for a total of five days after the education decreased statistically significantly compared to before the education ($p<0.05$).

Table 1 Descriptive characteristics of the patients (n= 101)

Characteristics		n	%
Age	57.20 ± 9.18*		
Gender	Female	38	37.6
	Male	63	62.4
Marital status	Married	84	83.2
	Single	17	16,8
Educational status	Primary	15	14.9
	Secondary	23	22.8
	High school and above	63	62.3
Income status	Income exceeds expenditure	9	8.9
	Income equal to expenditure	47	46.5
	Income less than expenditure	46	44.6
Health Insurance	Yes	92	91.1
	No	9	8.9
Presence of additional chronic disease	Yes	85	84.2
	No	16	15.8

Discussion

This study, to increase awareness and knowledge about the significance of noise in hemodialysis units, assessed the noise level on various days and hours. It revealed that patients undergoing hemodialysis were exposed to a wide range of noise sources and that staff members in the unit had little awareness of how to control noise. The results of the study indicate a significant impact of face-to-face education on the reduction of noise in hemodialysis units. However, the staff members' education on the topic decreased both the unit's noise level and the patient's level of noise disturbance. The study also contributed significant data to the literature on the topic and raised staff awareness.

It is seen that most of the studies on indoor noise in hospitals were conducted in intensive care units. (7, 25). There are very few studies evaluating noise in hemodialysis units (10). The fact that the mean score (7±9.23) given by the patients participating in our study to the noise scale between 0-10 is quite high shows how important the noise perceived by the patients is in hemodialysis units. In the intensive care units of hospitals, in addition to the sounds caused by medical devices and alarms used for life support, there are also sounds caused by the personnel working in this field (26, 27). Dialysis devices and alarms, which are at least as much a source of noise as hemodialysis units, are among the most important causes of noise in these units (10, 28). In addition, the sounds originating from the employees in the hemodialysis unit are also important. Many reasons such as food distribution, cleaning, nursing services, rounds, the high number of entrances and exits, and television/telephone sounds can be listed as noise sources (10, 28). When we look at the noise sources that the patients who participated in our study were disturbed by, confirm this information in the literature (Table 3). The detailed examination of noise sources and their impact on hemodialysis units provides valuable insights into the

Table 2 Descriptive characteristics of the Hemodialysis Unit employees (n= 50)

Characteristics		n	%
Age	32.56 ± 5.743*		
Gender	Female	23	46.0
	Male	27	54.0
Marital status	Married	24	48.0
	Single	26	52.0
Educational status	Secondary	3	6.0
	High school	17	34.0
	University and above	30	60.0
Occupation	Nurse	18	36.0
	Physician	6	12.0
	Dialysis Technician	22	44.0
	Medical Secretary	1	2.0
	Cleaning Staff	3	6.0
Working time	1 year and less	12	24.0
	2-5 years	28	56.0
	6-9 yıl	6	12.0
	10 years and above	4	8.0
Working Time in HD Unit	1 year and less	40	80.0
	2-5 years	8	16.0
	10 years and above	2	4.0

Table 3 The level of discomfort of the patients from the following conditions during hemodialysis (n= 101)

		Employee Pre-Education		Employee Post-Education	
		n	%	n	%
I am disturbed by noise during cleaning services	**A little**	2	2.0	22	21.8
	Moderate	27	26.7	79	78.2
	A lot	72	71.3	-	-
I am disturbed by the noise during the transportation of medical supplies	**A little**	1	1.0	30	29,7
	Moderate	30	29,7	61	60.1
	A lot	70	69.3	10	10.2
I am uncomfortable with health personnel entering and exiting the hall from outside	**A little**	1	1.0	8	7.9
	Moderate	27	26.7	67	66.3
	A lot	73	72.3	26	25.7
I am uncomfortable with patients' relatives entering and leaving the hall from outside	**A little**	2	2.0	21	20.8
	Moderate	20	19.8	62	60.6
	A lot	79	78,2	18	18.6
I am disturbed by the conversations of other patients in the room	**A little**	1	1.0	59	58.4
	Moderate	22	21.8	42	41.6
	A lot	78	77.2	-	-
I am disturbed by the conversations of nurses, physicians, and other health personnel in the hall	**A little**	-	-	5	5.0
	Moderate	25	24.8	61	60.4
	A lot	76	75,2	35	34.7
I am disturbed by the speech of the student nurses in the hall	**A little**	2	2.0	6	5.9
	Moderate	12	11.9	65	64.4
	A lot	87	86.1	30	29.7
I am disturbed by the computer, printer, and medical secretarial work in the hall	**A little**	1	1.0	9	8.9
	Moderate	19	18.8	47	46.5
	A lot	81	80.2	45	44.6
I am disturbed by the sound of the phone and phone calls at the desk	**A little**	1	1.0	5	5.0
	Moderate	14	13.9	65	64.4
	A lot	86	85.1	31	30.7
I am disturbed by the sound of cell phones and phone calls of employees or patients/ patient relatives	**A little**	1	1.0	15	14.9
	Moderate	17	16.8	53	52.5
	A lot	83	82.2	33	32.7
I am disturbed by the footsteps of the medical team and other staff in the hall	**A little**	1	1.0	58	57.4
	Moderate	16	15.8	38	37.6
	A lot	84	83.2	5	5.0
I am disturbed by the sound of hemodialysis machines and alarm sounds	**A little**	1	1.0	4	4.0
	Moderate	22	21.8	43	42.6
	A lot	78	77.2	54	53.5

Table 3 continued The level of discomfort of the patients from the following conditions during hemodialysis (n= 101)

I am disturbed by the sounds of television, music, etc.	**A little**	1	1.0	38	37.6
	Moderate	11	10.9	56	55.4
	A lot	89	88.1	7	7.0
I am disturbed by sounds coming from the patient next to me (snoring, crying, moaning, talking, etc.)	**A little**	1	1.0	14	13.9
	Moderate	16	15.8	53	52.5
	A lot	84	83.2	34	33.7
I am disturbed by the noise during care and treatment in the salon	**A little**	1	1.0	62	61.4
	Moderate	13	12.9	31	30.7
	A lot	87	86.1	8	7.9
I am disturbed by the rush of emergencies	**A little**	2	2.0	10	9.9
	Moderate	13	12.9	43	42.6
	A lot	86	85.1	48	47.5
I am disturbed by noise during breakfast, snacks, and food distribution	**A little**	1	1.0	8	7.9
	Moderate	8	7.9	52	51.5
	A lot	92	91.1	41	40.6
I am disturbed by noises coming from the corridor	**A little**	3	3.0	11	10.9
	Moderate	13	12.9	60	59.4
	A lot	85	84.1	30	29.7
I am disturbed by noises coming from the environment such as drinking tea, coffee and eating	**A little**	1	1.0	10	9.9
	Moderate	16	15.8	52	51.5
	A lot	84	83.2	39	38.6
I am disturbed by noises during the unpacking of materials and packages	**A little**	1	1.0	11	10.9
	Moderate	12	11.9	57	56.4
	A lot	88	87.1	33	32.7
I am disturbed by the noise of the air conditioners	**A little**	1	1.0	6	5.9
	Moderate	11	10.9	58	57.5
	A lot	89	88.2	37	36.6
I am disturbed by doors opening and closing	**A little**	1	1.0	6	5.9
	Moderate	10	9.9	56	55.4
	A lot	90	89.1	39	38.6
I am disturbed by the constant opening and closing of cabinets, drawers, windows, etc.	**A little**	1	1.0	5	5.0
	Moderate	9	8.9	64	63.4
	A lot	91	90.1	32	31.7
I am disturbed by ambient sounds entering the hall from the hospital surroundings (car, construction, conversations, etc.)	**A little**	1	1.0	8	8.2
	Moderate	11	10.9	11	10.7
	A lot	89	88.1	82	81.1
I am disturbed by the sound of an ambulance in the hall	**A little**	3	3.0	5	5.0
	Moderate	7	6.9	9	8.7
	A lot	91	90.1	87	86.3

Table 4 Opinions of Hemodialysis Unit employees about noise (n= 50)

		n	%
Is there a noisy working environment in your unit?	Yes	10	20.0
	No	40	80.0
Does Working in a Noisy Environment distract you?	Yes	14	28.0
	No	5	10.0
	Sometimes	31	62.0
Have you attended any education on noise and noise control?	Yes	4	8.0
	No	46	92.0
Do You Think Noise in Your Unit Affects Patients and Staff?	Yes	5	10.0
	No	7	14.0
	Sometimes	35	70.0
	I don't know	3	6.0
Do you take noise-reducing measures in your operations related to the service you provide?	Yes	20	40.0
	No	11	22.0
	Sometimes	19	38.0
Is the noise level measured in your unit?			
	Yes	10	20.0
	No	5	10.0
	I don't know	35	70.0
Would You Like to Receive Education on Noise and Noise Control?	Yes	9	18.0
	No	41	82.0

Table 5 The median of the recorded noise measurements of the pre-education and post-education

Days	**Monday**		**Tuesday**		**Wednesday**		**Thursday**		**Friday**	
Measuring Time	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
08:30	70	62	73	64	72	62	73	64	75	62
10:30	68	59	65	57	65	59	63	56	65	58
12:30	78	64	79	66	76	65	78	68	76	67
15:30	76	65	78	63	74	61	75	65	79	63

multifaceted nature of noise pollution in healthcare settings. The findings of the study underscore the significance of a comprehensive understanding of the various sources of noise and their effects on both patients and healthcare staff. The substantial mean score reported by patients on the noise scale, coupled with their discomfort levels before the educational intervention, emphasizes the pronounced impact of noise on the patient experience during hemodialysis sessions. Furthermore, the identification of specific sources of noise, such as dialysis devices, alarms, and activities of the staff, resonates with existing

Table 6 The relation between of noise measurements of the pre-education and post-education

	Min	Max	Mean	Std. Deviation	t-test	p
Pre-education	31	79	73,39	6,750	59.410*	**.000****
Post-education	26	68	58.12	4.642		

*Paired Samples t-test ** p<0.05

literature, highlighting the multitude of contributors to noise pollution within hemodialysis units (21, 26). The comprehensive exploration of noise sources and their effects, informed by patient perspectives and staff awareness, lays a strong foundation for tailored noise reduction strategies in hemodialysis units. By illuminating the diverse range of contributors to noise pollution and their implications for patient comfort and staff well-being, the study sets the stage for targeted interventions aimed at mitigating noise levels and fostering a more conducive environment for all stakeholders within the hemodialysis unit.

Noise in hemodialysis units is important not only for patients but also for the working performance and psychological well-being of all personnel working in this unit (29, 30). In addition, awareness and education of personnel on the subject are important for noise control (31). The opinions of the hemodialysis workers who participated in our study about noise in the hemodialysis unit are parallel with this information in the literature (Table 4). Furthermore, the high mean score reported by patients on the noise scale, coupled with their discomfort levels before the education, highlights the profound impact of noise on the patient experience during hemodialysis sessions. The subsequent decrease in these scores following the educational intervention not only validates the efficacy of the intervention but also emphasizes the positive influence on addressing patients' concerns and enhancing their comfort during treatment. It is noteworthy that the awareness of the personnel participating in our study on noise is low and they have not received education on the subject. This may be due to adaptation to the environment and normalization of noise. It shows that hospitals should address the issue in in-service education programs for staff. In addition to acoustic design and equipment design, another important application in the prevention and reduction of noise pollution in hospitals is staff education (20, 32, 33). While acoustic and equipment design plays a critical role in mitigating noise at its source, the heart of sustainable noise reduction lies within staff behavior and practice. Educational interventions have been identified as a cost-effective approach to noise management, fostering a culture of awareness and responsibility among healthcare workers. By increasing understanding of the impact noise has on patient outcomes and employee well-being, educational programs can catalyze the adoption of noise-reducing practices (2,6,7, 34- 36). In addition, the most cost-effective strategy mentioned in the literature is the education of healthcare workers (33, 35). The most obvious way to reduce noise is to raise staff awareness, educate them about the effects of noise, and provide them with viable alternative interventions that they can incorporate into their daily practice (31, 33). Raising staff awareness and educating healthcare workers about the effects of noise are pivotal aspects of a multifaceted approach to noise reduction in healthcare settings. By providing staff with training on the impact of noise and its consequences on patients' health and well-being, hospitals can foster a more mindful workplace. Education programs should aim to empower staff with knowledge and tools to actively reduce noise pollution (6, 21, 37).

In our study, when we look at the noise measurement values made on five days of the week and at four different times of the day, it is seen that the noise level is the highest at noon. This is an expected result since lunchtime is a busy time when the treatment of morning session patients is completed and afternoon patients are received. In addition, in our study, it is seen that the noise control education given to the staff reduced the noise measurement values made five days a week. When the relationship between the daily noise averages measured during the whole week before and after the education is examined, the statistically significant decrease in the noise level shows that the education received by the personnel on noise control has turned into behavior. The reduction in noise following the implementation of noise control education signifies a successful translation of theory into practice. By equipping staff with the knowledge and strategies to control noise, we have shown that it is possible to effect a statistically significant change in the acoustic environment of a healthcare setting.

Conclusion

Our study showed that the noise levels in hemodialysis units are disturbing for patients, the knowledge and awareness of the personnel on the subject is low, education programs including noise prevention and reduction strategies increase the knowledge and awareness of the personnel and rapidly turn into behaviors and education is effective in noise control. In line with these results, it is recommended that noise level measurements should be performed routinely by the hospital, personnel should be trained periodically with in-service education and necessary inspections should be made to ensure employee and patient safety in hemodialysis units to reduce patients' anxiety, increase their comfort and positively affect psychological and physiological parameters. In addition, conducting studies on noise and its effects on patients and employees in hemodialysis units will reveal the importance of the issue more clearly.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

Ethical Approval
Ethics approval to conduct the study was obtained from Burdur Mehmet Akif Ersoy University Non-Interventional Clinical Research Ethics Committee (Decision no: 2020-3/43, Decision date: March 4, 2020). In addition, permission was received from the medical directors of the related HD center for the study. The purpose of the study was explained to each participant in a face-to-face interview by the research staff, and written consents were obtained from the patients approved to enter this study. The study was conducted in accordance with the principles set forth in the Declaration of Helsinki.

Consent to Participate and Publish
Written informed consent to participate and publish was obtained from all individual participants included in the study.

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Availability of Data and Materials
Data are available on request due to privacy or other restrictions.

Authors Contributions
H.C: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing-original draft.

C.K.S: Investigation; Validation; Writing-original draft.

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