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Research Article

RELATIONSHIP BETWEEN SELF-REPORTED HAND HYGIENE BELIEFS AND HAND HYGIENE PRACTICES IN NURSING STUDENTS: A STRUCTURAL EQUATION MODELING

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Abstract: *Hand hygiene practice is very important in preventing health-related infections. It is reported that hand hygiene belief is an important indicator for hand hygiene practice. Determining the relationship between hand hygiene practice and hand hygiene beliefs is extremely important to increase hand hygiene compliance. The objective of this study is to examine the relationship between self-reported hand hygiene beliefs and hand hygiene practices in nursing students. This study used a predictive correlational design and was conducted at a nursing department of a state university in Turkey. A total of 305 nursing students who were selected by convenience sampling, had received at least one year of nursing education, and had clinical practice experience were surveyed. The data were collected by a sociodemographic data collection form, the "Hand Hygiene Beliefs Scale" and the "Hand Hygiene Practice Inventory". Frequency analysis, simple linear regression analysis, correlation analysis, and structural equation modeling were used in data analysis. The total mean scores of the students in the Hand Hygiene Beliefs Scale and the Hand Hygiene Practice Inventory were 92.53±7.58 and 65.36±4.92, respectively. A significant positive correlation was found between hand hygiene beliefs and practices ($r = 0.42$; $p<0.01$). In this study the Hand Hygiene Beliefs Scale score and Hand Hygiene Practice Inventory scores of the students were high. In our study, a highly significant positive relationship was found between hand hygiene beliefs and practices. It is thought that positive hand hygiene beliefs will contribute to the evaluation of hand hygiene practices. It is recommended that students be supported to further develop their hand hygiene beliefs.*

Keywords: *hand hygiene, nursing, students, beliefs, practices, nosocomial infection*

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1. Introduction

Nosocomial infections are one of the most significant factors that increase the length of hospital stay, morbidity and mortality, and healthcare expenses. Ensuring adequate hand hygiene is one of the measures to protect oneself against infections, which cause high morbidity, mortality, and treatment expenses [1]. Nurses, who are most in contact with the patient during the provision of healthcare, are healthcare workers that are working on the very frontlines especially during epidemics of contagious diseases. While they are trying to provide healthcare services by working today at the closest quarters in the fight against COVID-19 on the one hand, on the other hand, they carry the risk of exposure to the pathogen in their working environment and transferring the pathogen [2]. Most infections acquired from healthcare services may be prevented by appropriate hand hygiene compliance, protective equipment usage, and well-trained nurses.

Although it is emphasized in the literature that hand washing is the most important procedure alone in preventing infections, it is known that nurses' compliance with handwashing protocols is

insufficient [1,3–5]. Studies on this issue report that nurses' incompatibility with handwashing depends on several reasons. Many factors such as individual characteristics, level of knowledge on hand hygiene, perception of importance regarding hand hygiene, professional experience, gender, perception of the severity of infectious diseases, work intensity, and lack of role models may affect hand hygiene compliance behaviors [1,6,7]. Although handwashing rates are found to be different in many studies conducted on handwashing, the common point of all studies is that the handwashing rates of nurses are lower than expected [1,8–10]. In addition to the increase in nosocomial infections, this situation is also a factor in the direct and indirect transmission of infections from the hospital environment to society. Microorganisms that cause nosocomial infections may spread to society through discharged patients, employees or visitors. This situation also creates a multifactorial public health problem that is complex to control and prevent [11–13].

Human behavior is affected by biological characteristics, environment, education, and culture [14]. In compliance with hand hygiene behaviors, education is an important factor in terms of reducing and eliminating nosocomial infections and their spread, lowering treatment costs in relation to these infections, and preventing loss of labor [15]. For this reason, investigation of the hand hygiene practices of nursing students who are the healthcare labor of the future carries importance. This is because the nursing training process is an important process that can provide students with behavior change-acquisition by providing them with the opportunity to take on all kinds of factors that lead to non-compliance regarding hand hygiene practices in both clinical and theoretical fields [16]. Lymer et al. (2004) suggested that nursing students are in an ideal position to promote effective hand hygiene as they can act as agents of change in practice by sharing good hand hygiene knowledge and practices with qualified staff [17]. Looking at the literature, a previous study reported that the rate of nursing students believing in the importance of hand hygiene to be 89% [10]. Karadağ et al. (2016) determined the mean total hand hygiene belief scale score of nursing students as 86.39±8.56 (high) and their mean total hand hygiene practice inventory scores as 64.52±4.90 (high) [15]. Van de Mortel et al. reported the mean importance of hand hygiene scores (on a scale of 1-10) in students of nursing and those of medicine in Greece as respectively 9.60±0.008 and 9.29±0.2 [6]. while these were reported in nursing and medicine students in Italy as respectively 9.68±0.71 and 9.59± 0.84 [18].

In the literature; some studies are stating that beliefs are a significant predictor in putting knowledge into practice [15], that there is a low level of relationship between beliefs and practice [19], and that there is no significant relationship between beliefs and practice [20]. It is believed that defining the hand hygiene beliefs of nursing students may affect their hand hygiene knowledge and practices and may help develop a positive point of view towards hand hygiene practice culture. In this sense, it is important to determine the hand hygiene belief and practice statuses of nursing students and the relationship between these. The purpose of this study is to examine the relationship between self-reported hand hygiene beliefs and hand hygiene practices in nursing students.

2. Materials and Methods

2.1. Design and Participants:

This predictive correlational study was conducted among nursing students at Bursa Uludağ University Faculty of Health Sciences in 2020 in Turkey. The population of the study consisted of second, third, and fourth-year nursing students who received at least one year of nursing education and had clinical practice experience (n=431). The study was completed with 305 students who volunteered to participate in the study. After students were informed, verbal approval was obtained from the participants and the sociodemographic data collection form and scale forms were distributed to students in the classroom before the lessons starts. It was stated to the participants that the data collected will only be used for the research and will not be shared with any other institution or person. Before the

application, it was stated that participation in the study was not mandatory and that the study group consisted only of voluntary participants. The time required to apply the scale and the sociodemographic data collection form is 10 minutes.

2.2. Instruments

The data were collected by using a sociodemographic data collection form, the "Hand Hygiene Beliefs Scale" and the "Hand Hygiene Practices Inventory".

2.2.1 Sociodemographic Data Collection Form

The form was developed by the researcher and consisted of 3 questions to determine the socio-demographic characteristics (gender, grade level, type of high school of graduation) and 2 questions to determine the status of training on hand hygiene and the importance of nursing students attach to hand hygiene.

2.2.2 Hand Hygiene Beliefs Scale and Hand Hygiene Practices Inventory

The Hand Hygiene Beliefs Scale (HHBS) and the Hand Hygiene Practices Inventory (HHPI) were developed by Thea Van de Mortel in 2009 to determine the beliefs of individuals regarding hand hygiene and the situations where they practice hand hygiene [7]. The original form of HHBS consists of 23 items including hand hygiene beliefs (20 items) and the importance and perception of hand hygiene (3 items). In the pilot study of the Turkish version of the scale, since the students stated that they had difficulty in filling up the item of *"If I disagree with a guideline, I look for research findings to guide my practice"* due to the lack of application guidelines in the clinical environment, this item was removed from HHBS. The Turkish scale, therefore, consists of 22 items. According to the fit indices stipulated in the confirmatory factor analysis of the scale, it was concluded that the two-factor structure of the original HHBS is not appropriate for the Turkish Scale. Therefore, the Turkish form of HHBS has a one-factor structure [21]. HHBS is scored as a five-point Likert-type scale in the form of: 1 "strongly disagree", 2 "disagree", 3 "undecided", 4 "agree", 5 "strongly agree". In the final assessments, it was decided to perform a reverse evaluation for items 5, 8, 16, 17, 18, 19, and 20. In calculating the score of the scale, the scores of the answers given to the questions are summed up. The total score of HHBS ranges between 22 and 110 points, and a high score refers to a positive belief in hand hygiene. In the Turkish validity and reliability study of the scale, the internal consistency coefficient of the scale was found as 0.76.

HHPI is a 5-point Likert-type scale that consists of 14 items. The scoring of the scale is as follows: 1 "never", 2 "seldom", 3 "occasionally", 4 "usually", 5 "always". In calculating the score of the scale, the scores of the answers given to the questions are summed up. The total score of HHPI ranges between 14 and 70 points, and a high score indicates that hand hygiene practices are performed more frequently. In the Turkish validity and reliability study of the scale, its internal consistency coefficient was found as 0.85. For HHPI, as in the original inventory, the single-factor structure was found to be appropriate in Turkish. As a result, HHBS and HHPI that were adapted into Turkish were found to be valid and reliable measurement tools to measure hand hygiene beliefs and practices [21].

2.3. Statistical Analysis

In the study, Kolmogorov–Smirnov test, histograms, and QQ plots were used to test the normality of the distribution of the variables. Additionally, the homogeneity of the data set and whether there was a linear relationship between the variables were also examined, and it was found that the data set had the basic conditions required for parametric analysis. The relationships between HHBS and HHPI were examined by Pearson's Product-Moment Correlation and Simple Linear Regression Analysis. To determine the common (shared) variance between HHBS and HHPI, the structural equation modeling method was used. Data analysis was carried out using the SPSS 23.00 and SPSS Amos 23.00 programs.

2.4. Ethical Considerations

Ethics committee approval was obtained from the Bursa Uludağ University Health Sciences Research and Publication Ethics Committee (Decision no. 2020/01-08 and dated 29.01.2020) and institution approval of the study was obtained from the Dean of the Faculty of Health Sciences (Decision no. 45226392-605/E.334). During the study, ethical principles (permission to use the scales, informed consent from students, and the confidentiality of information and principles of the Declaration of Helsinki) were taken into consideration.

3. Results

Two hundred and forty-seven (81%) of the students in the sample were female, 109 (35.7%) of them were second-year students, 29 (9.5%) of them were high-school graduates, and 24 of them had graduated from several high schools. Two hundred and sixty-nine (88.2%) of the participants had received training on hand hygiene, and 48 (15.7%) described hand hygiene to be "important". Table 1 shows the sociodemographic characteristics of the sample.

Table 1. Sociodemographic characteristics of the study group

Sociodemographic Characteristics	n (%)
Gender Female Male	 247 (81.0) 58 (19.0)
Class Second Year Third Year Fourth Year	 109 (35.7) 112 (36.7) 84 (27.5)
Graduated High School High School Medical-Vocational High School Private High School Science/Anatolian High School Imam Hatip High School Other High Schools	 29 (9.5) 49 (16.1) 12 (3.9) 174 (57) 17 (5.6) 24 (7.9)
Have you received training on hand hygiene? Yes No	 269 (88.2) 36 (11.8)
How important is hand hygiene to you? Important Very Important	 48 (15.7) 257 (84.3)
Total	305 (100.0)

The mean score of the students on HHBS was 92.53±7.58, and their mean score on HHPI was 65.36±4.92. The mean scores of HHBS and HHPI are given in Table 2.

Table 2. Descriptive statistics of HHBS and HHPI (n = 305)

Scales	X̄±SD	M	Min.	Max.
HHBS	92.53±7.58	93.00	53.00	110.0
HHPI	65.36±4.92	66.00	45.00	70.00

HHPI: Hand Hygiene Practices Inventory, HHBS: Hand Hygiene Beliefs Scale, X̄: Mean, SD: Standard Deviation, M: Median, Min: Minimum, Max: Maximum

Table 3 shows the correlation, arithmetic mean, standard deviation, skewness, and kurtosis values between HHBS and HHPI. Examining Table 3, it is seen that there was a positive and moderate significant relationship between HHBS and HHPI (r = .42; p<0.01). Additionally, it was determined in the study that the skewness and kurtosis values of the variables satisfied the normality hypothesis.

Table 3. Pearson's correlation analysis and descriptive results for the relationship between HHBS and HHPI

Pearson Correlation	HHPI
HHBS	0.42**
X̄	13.8
SS	3.7
Skewness	0.46
Kurtosis	0.26

**p<0.01, HHPI: Hand Hygiene Practices Inventory, HHBS: Hand Hygiene Beliefs Scale

According to the results of simple linear regression analysis, it was determined that the HHBS had a significant positive effect on the HHPI (R^2=0.242; p<0.01). One unit increase in HHBS score increases the HHPI score by 0.41 points. The Simple Linear Regression Analysis Results between HHPI and HHBS are given in Table 4.

Tablo 4. Simple linear regression analysis results between HHPI and HHBS

HHPI	Unstandardized		Standardized	*t*	*p*	*VIF*
	β	*SE*	*β*			
Constant	39.705	3.135	-	12.665	0.000	-
HHBS	0.417	0.034	0.497	8.211	0.000	1100
***R^2*= 0.242; *Durbin Watson*= 1.630**						

HHPI: Hand Hygiene Practices Inventory, HHBS: Hand Hygiene Beliefs Scale

After determining the significant relationships between HHBS and HHPI, the predictive effect of HHBS on HHPI was tested with the structural equation modeling method. Since the data showed normal distribution as a result of the Kolmogorov-Smirnov test, the produced hypothesis was tested using the maximum likelihood method. For this purpose, firstly, the confirmatory measurement model related to the model fit of HHBS and HHPI was hypothesized. A positive and significant relationship (β =.50) was found between HHBS and HHPI in the model, and the findings that were obtained are presented in Figure 1.

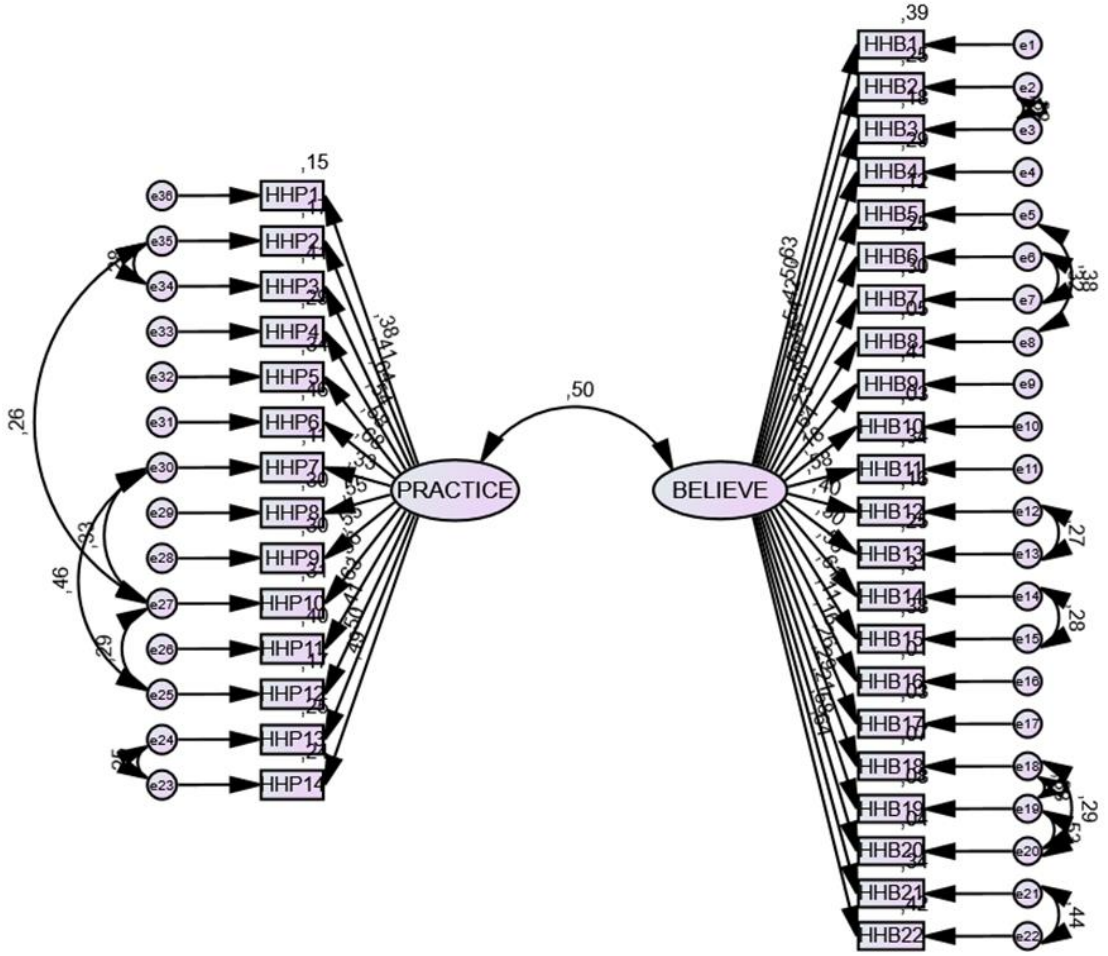

Figure 1. Confirmatory measurement model between HHBS and HHPI

In the study, the model fit indices of the confirmatory measurement model hypothesized between HHBS and HHPI were significant. Table 5 shows the perfect and admissible fit criteria for the fit index values obtained from the model and the results in this direction.

Table 5. Perfect and admissible criteria regarding fit indices examined in the research and fit index values obtained from measurement model goodness of fit indices

Fit Indices Reviewed	Perfect Fit Criteria	Admissible Fit Criteria	Fit Indices Obtained	Result
χ^2/df	$0 \leq \chi^2/df \leq 2$	$2 \leq \chi^2/df \leq 3$	1.689	Perfect Fit
GFI	.95≤ GFI ≤ 1.00	.90≤GFI≤95	.90	Admissible Fit
AGFI	.90≤ AGFI ≤ 1.00	.85≤ AGFI ≤ .90	.86	Admissible Fit
CFI	.95≤ CFI ≤ 1.00	.90≤ CFI ≤ .95	.90	Admissible Fit
NFI	.95≤ NFI ≤ 1.00	.90≤ NFI ≤ .95	.91	Admissible Fit
NNFI	.95≤ NNFI ≤ 1.00	.90≤ NNFI ≤ .95	.93	Admissible Fit
IFI	.95≤ IFI ≤ 1.00	.90≤ IFI ≤ .95	.96	Perfect Fit
RMSEA	.00≤ RMSEA ≤ .05	.05 ≤ RMSEA ≤ .08	. 048	Perfect Fit
SRMR	.00≤ SRMR ≤ .05	.05 ≤ SRMR ≤ .10	.06	Admissible Fit

χ2/df: chi-square fit, GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of Fit Index, CFI: Comparative Fit Index, NFI: Normed Fit Index, NNFI: Non-normed Fit Index, IFI: Incremental Fit index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual.

The perfect and admissible fit criteria for the fit indices shown in Table 5 revealed that the proposed model was validated by the data. When the model was hypothesized and tested to determine the predictive effect of HHBS on HHPI, and the fit indices of this model were examined, the tested model was approved, and it showed high goodness of fit. As seen in Figure 2, the implicit variable of "Belief" predicted the implicit variable of "Practice" positively and on a good level (β=.50; t=5.76). This value implied that a 1-point increase in HHBS would lead to an increase of 0.50 points in HHPI, or in the opposite care, a 1-point decrease in HHBS would lead to a decrease of 0.50 points in HHPI. Based on this finding, it may be stated that the hand hygiene beliefs of the nursing students had a positive effect on their hand hygiene practices. It was also found that HHBS explained 25% of HHPI and on the significance level of 0.001 (R^2 =0.25; p <0.01). The findings related to the model are given in Figure 2, and the findings regarding the fit indices of the model are given in Table 6.

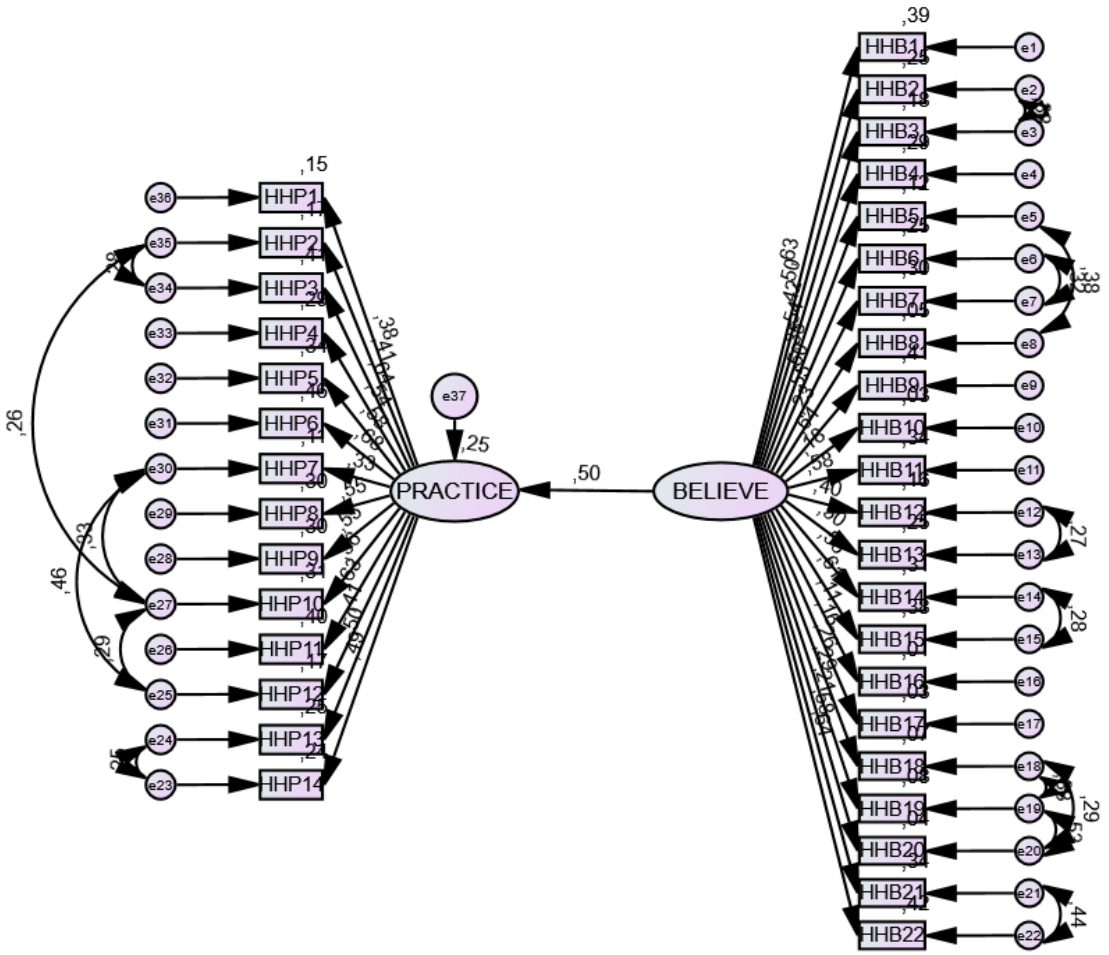

Figure 2. Structural equation model between HHBS and HHPI

Table 6. Model goodness of fit related to structural equation model

χ^2	df	χ^2/ df	GFI	AGFI	NFI	NNFI	CFI	IFI	RMSEA	SRMR
9.76	5.78	1.68	0.90	0.86	0.91	0.93	0.90	0.95	0.048	0.06

χ2/df: chi-square fit, GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of Fit Index, CFI: Comparative Fit Index, NFI: Normed Fit Index, NNFI: Non-normed Fit Index, IFI: Incremental Fit index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual.

4. Discussion

Hand hygiene practices are practices that have a tendency to be affected by personal beliefs and attitudes. Positive hand hygiene beliefs are expected to affect hand hygiene practices positively. [10,22]. The mean HHBS score of the students in this study was found as 92.53±7.58 (high) (Table 2). Similar results were reported in the literature [6,15,18,23]. It is thought that high hand hygiene belief scores of students will affect their hand hygiene practices positively, and positive hand hygiene beliefs will allow evaluation of hand hygiene practices and improvement of learning outcomes.

In line with the theoretical and clinical skills provided by nursing training, it is expected for nursing students to have high hand hygiene practice and handwashing behavior levels [24]. According to the results of this study, the mean HHPI score of the students was found as 65.36±4.92 (high) (Table 2). Bayram et al. (2019) reported the mean HHPI score of students as 64.26±5.33 [24]. Karadağ et al. (2016) stated the mean HHPI score of students as 64.52±4.90 [15]. Another study by Karadağ et al. (2016) determined that the mean HHPI score of students was high [21]. Similar results were obtained in studies conducted in Australia by van de Mortel (2009) [7] and in Greece [6] and Italy [18] by van de Mortel et al. (2010). The result of our study supported the literature.

It is thought that determining hand hygiene beliefs may be an important parameter in guiding the hand hygiene practices of students [21]. In this study, it was determined that there was a positive significant relationship between HHBS and HHPI ($p<0.05$; Table 3). According to the results of simple linear regression analysis, it was determined that the HHBS had a significant positive effect on the HHPI ($p<0.05$; Table 4). One unit increase in HHBS score increases the HHPI score by 0.41 points. Hand hygiene beliefs predicted hand hygiene practices in a positive direction and on a good level (Figure 2). This result proved that an increase in the hand hygiene beliefs of nursing students would affect their hand hygiene practices in a positive direction. There are similar studies in the literature where the positive relationship between hand hygiene beliefs and practices was discussed [5,6,21,25]. Nevertheless, it is believed that this study will contribute to the literature in terms of structurally testing the relationship between hand hygiene beliefs and hand hygiene practices.

5. Conclusion

According to the results of the study, the HHBS and HHPI scores of the students were high. In our study, a positive and highly significant relationship was found between HHBS and HHPI. In line with these results:

- It carries importance to prepare the appropriate curriculum for increasing and achieving the sustainability of the hand hygiene beliefs of nursing students. Especially in pandemic processes such as COVID-19, the position of nurses equipped in terms of hand hygiene compliance is important in healthcare services in terms of preventing the spread of infections and reducing hospital infections. It is believed that the nursing training process is an opportunity for this.

Limitation

The fact that this study was carried out only on students of the faculty of health sciences at one university in Turkey may be considered as a factor limiting the generalizability of the findings obtained from the research. It is thought that conducting studies with larger samples in different cultures and populations will contribute to the literature. Another limitation of the study is that there is potential for bias in that the students know what is the 'right' answer and they may be over-reporting either their beliefs and/or their behavior.

Ethical Consideration

Ethics committee approval was obtained from the Bursa Uludağ University Health Sciences Research and Publication Ethics Committee (Decision no. 2020/01-08 and dated 29.01.2020) and

institution approval of the study was obtained from the Dean of the Faculty of Health Sciences (Decision no. 45226392-605/E.334).

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Conflict of Interest

The author declares no conflict of interest.

References

[1] Pittet, D., Simon, A., Hugonnet, S., Pessoa-Silva, C., Sauvan, V., Perneger, T., "Hand hygiene among physicians: Performance, beliefs, and perceptions," *Annals of Internal Medicine,* 141(1), 1–8, 2004. Doi: 10.7326/0003-4819-141-1-200407060-00008

[2] WHO, "Nurses are the heart of our health-care system," World Health Organization, 2020. https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/5/nurses-are-the-heart-of-our-health-care-system-shoshy-goldberg,-government-chief-nursing-officer,-israel

[3] Hugonnet, S., Pittet, D., "Hand hygiene—beliefs or science?," *Clinical Microbiology and Infection,* 6(7), 348–354, 2000. Doi: 10.1046/j.1469-0691.2000.00104.x

[4] Akyol, A. D., "Hand hygiene among nurses in Turkey: Opinions and practices," *Journal of Clinical Nursing*, 16(3), 431–437, 2007. Doi: 10.1111/j.1365-2702.2005.01543.x

[5] Karaoğlu, M. K., Akın, S., "Evaluation of Nurses' Views about Hand Washing Habits and Hand Hygiene Compliance Rates," *Journal of Education and Research in Nursing,* 16(1), 33–40, 2019. Doi: 10.5222/HEAD.2019.033

[6] Van de Mortel, T., Apostolopoulou, E., Petrikkos, G., "A comparison of the hand hygiene knowledge, beliefs, and practices of Greek nursing and medical students," *American Journal of Infection Control,* 38(1), 75–77, 2010. Doi: 10.1016/j.ajic.2009.05.006

[7] Van de Mortel, T., "Development of a questionnaire to assess health care students' hand hygiene knowledge, beliefs and practices," *Australian Journal of Advanced Nursing,* 26(3), 9–16, 2009. https://pdfs.semanticscholar.org/c170/4775ad0cddbe2c74aa94fc703a056eed4d1e.pdf

[8] Moret, L., Tequi, B., Lombrail, P., "Should self-assessment methods be used to measure compliance with handwashing recommendations? A study carried out in a French university hospital," *American Journal of Infection Control*, 32(7), 384–390, 2004. Doi: 10.1016/j.ajic.2004.02.004

[9] Larson, E. L., Aiello, A. E., Cimiotti, J., "Assessing nurses' hand hygiene practices by direct observation or self-report.," *Journal of Nursing Measurement,* 12(1), 77–85, 2004. http://www.ncbi.nlm.nih.gov/pubmed/15916321

[10] Aiello, A. E., Malinis, M., Knapp, J. K., Mody, L., "The influence of knowledge, perceptions, and beliefs, on hand hygiene practices in nursing homes," *American Journal of Infection Control,* 37(2), 164–167, 2009. Doi: 10.1016/j.ajic.2008.04.258

[11] Cebeci, F., Gürsoy, E., Tekingündüz, S., "Examination of The Tendency for Nursing Malpractice and Affecting Factors," *Journal of Anatolia Nursing and Health Sciences,* 15(3), 188–196, 2012. https://dergipark.org.tr/tr/pub/ataunihem/issue/2658/34258

[12] Ertek, M., "Hospital infections: The data of Turkey," *Istanbul University Cerrahpasa Medical Faculty Continuous Medical Education Activities, Symposium Series,* 60(1), 9–14, 2008. http://ctf.edu.tr/stek/pdfs/60/6001.pdf

[13] Aylaz, R., Şahin, F., Yıldırım, H., "Determination of Knowledge Level Related to the Subject of Hospital Infection of the Nurses," *Balıkesir Journal of Health Sciences,* 7(2), 67–73, 2017. https://dergipark.org.tr/en/download/article-file/544818

[14] Whitby, M., McLaws, M. L., Ross, M. W., "Why Healthcare Workers Don't Wash Their Hands: A Behavioral Explanation," *Infection Control & Hospital Epidemiology,* 27(5), 484–492, 2006. Doi: 10.1086/503335

[15] Karadağ, M., Pekin Iseri, Ö., Yildirim, N., Etikan, İ., "Knowledge, Beliefs and Practices of Nurses and Nursing Students for Hand Hygiene," *Jundishapur Journal of Health Sciences,* 8(4), 1–7, 2016. Doi: 10.17795/jjhs-36469

[16] Barrett, R., Randle, J., "Hand hygiene practices: nursing students' perceptions," *Journal of Clinical Nursing,* 17(14), 1851–1857, 2008. Doi: 10.1111/j.1365-2702.2007.02215.x

[17] Lymer, U. B., Richt, B., Isaksson, B., "Blood exposure: factors promoting healthcare worker's compliance with guidelines in concern with risk," *Journal of Clinical Nursing,* 13(5), 547–554, 2004. Doi: 10.1111/j.1365-2702.2004.00897.x

[18] Van de Mortel, T., Kermode, S., Progano, T., Sansoni, J., "A comparison of the hand hygiene knowledge, beliefs, and practices of Italian nursing and medical students," *Journal of Advanced Nursing,* 68(3), 569–579, 2012. Doi: 10.1111/j.1365-2648.2011.05758.x

[19] Al-Khawaldeh, O., Al-Hussami, M., Darawad, M., "Influence of Nursing Students Handwashing Knowledge, Beliefs, and Attitudes on Their Handwashing Compliance," *Scientific Research Publishing,* 7, 572–579, 2015. Doi: 10.4236/health.2015.75068

[20] Kiprotich, K., Kaminga, Chiwanda, A., Kessi, M., Honghong, W, "Observed and Self-reported Hand Hygiene Compliances and Associated Factors among Healthcare Workers at a County Referral Hospital in Kenya," *Research Square,* 1–16, 2020. Doi: 10.21203/rs.3.rs-79985/v1

[21] Karadağ, M., Yıldırım, N., Pekin İşleri, Ö, "The validity and reliability study of Hand Hygiene Belief Scale and Hand Hygiene Practices Inventory," *Cukurova Medical Journal,* 41(2), 271–284, 2016. Doi: 10.17826/cutf.206317

[22] Okgün Alcan, A., Dolgun, E., "Student Nurses' Hand Hygiene Beliefs and Practices," *Turkish Journal of Family Medicine and Primary Care,* 13(3), 279–286, 2019. Doi: 10.21763/tjfmpc.609778

[23] Hunt, D. C., Mohammudally, A., Stone, S. P., Dacre, J., "Hand-hygiene behaviour, attitudes and beliefs in first year clinical medical students," *Journal of Hospital Infections,* 59(4), 371–373, 2005. Doi: 10.1016/j.jhin.2004.09.002

[24] Bayram, Ş. B., Calışkan, N., Gülnar, E., Aydın, M., "The Effect of Planned Education on Hand-Washing Beliefs And Practices of Nursing Students: Non-Participant Observation Study With Pre-Post Test Design," *Gazi Journal of Health Sciences,* 4(2), 20–30, 2019. https://dergipark.org.tr/tr/download/article-file/903908

[25] Al-Hussami, M. O., Darawad, M. W., Almhairat, I., "Predictors of compliance hand hygiene practice among healthcare professionals.," *Healthcare Infection, 16, 79–84, 2011.* https://idhjournal.com/article/S1835-5617(16)30141-7/pdf