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Determination of Industry 4.0 Conceptual Awareness Levels of Midwifery Students

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Research Article

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ABSTRACT

Along with technological innovations in the world, the health industry has also developed and entered the digital transformation process. This study was designed as a descriptive study aiming to determine the awareness of midwifery students on Industry 4.0.

The population of the study consisted of students of the midwifery department of a university. The minimum sample size was calculated in G*power 3.1.9 program. Accordingly, the number of samples to be included in the study for 95% statistical power 0.05 margin of error was determined as 210. The study was completed with 257 midwifery students, taking possible losses into account. Personal Information Form and Industry 4.0 Conceptual Awareness Scale were used as data collection tools.

The average age of the students in the study was 21.22 ± 1.84 years, 31.9% of the students were 2nd-year students in the Department of Midwifery, 52.9% of the students had their own computers, 100% of them used smartphones, and 60.7% used computers. The average score of the students on the scale was 89.98 ± 30.5, and it was determined that the students' Industry 4.0 Conceptual Awareness was at a medium level according to the score obtained from the scale. When the relationship between the place where the students stayed and the scores obtained from the scale was examined, it was determined that there was a significant difference between the scores obtained from the scale of the students staying in the state dormitory and the students staying in the private dormitory ($p < 0.05$).

In the study, it was determined that the midwifery department students' Industry 4.0 Conceptual Awareness levels were at a moderate level, and the place of residence positively affected the level of awareness of this concept.

Keywords: Digital Technology, Midwifery, Industry, Awareness, Health

Ebelik Bölümü Öğrencilerinin Endüstri 4.0 Kavramsal Farkındalık Düzeylerinin Belirlenmesi

Süreç

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ÖZ

Dünyada teknolojik yeniliklerle birlikte sağlık endüstrisi de gelişim göstermiş ve dijital dönüşüm sürecine girilmiştir**.** Bu araştırma ebelik bölümü öğrencilerinin endüstri 4.0 farkındalıklarını belirlemeyi amaçlayan tanımlayıcı nitelikte tasarlanmıştır.

Araştırmanın evrenini bir üniversitenin ebelik bölümü öğrencileri oluşturmaktadır. Minimum örneklem sayısı G*power 3.1.9 programında hesaplanmıştır. Buna göre %95 istatistiksel güç 0.05 hata payı için araştırmaya dahil edilmesi gereken örneklem sayısı 210 olarak belirlenmiştir. Araştırmada olası kayıplarda göz önünde bulundurularak 257 ebelik öğrencisi ile tamamlanmıştır. Araştırmada veri toplama aracı olarak Kişisel Bilgi Formu ve Endüstri 4.0 Kavramsal Farkındalık Ölçeği kullanılmıştır.

Araştırmada öğrencilerin yaş ortalaması 21.22±1.84 yıl olup, öğrencilerin %31.9'u Ebelik bölümü 2.sınıf öğrencisidir. %52.9'unun kendine ait bilgisayarı olup, %100'ü akıllı telefon, %60.7'si bilgisayar kullanmaktadır. Öğrencilerin ölçekten aldığı puan ortalaması 89.98 ± 30.5 olup, ölçekten alınan puana göre öğrencilerin Endüstri 4.0 Kavramsal Farkındalıklarının orta düzeyde olduğu belirlenmiştir. Öğrencilerin kaldığı yer ve ölçekten alınan puanlar arasındaki ilişki incelendiğinde devlet yurdunda kalan öğrenciler ile özel yurtta kalan öğrencilerin ölçekten alınan puanlar arasında anlamlı fark olduğu belirlenmiştir ($p< 0.05$).

Araştırmada ebelik bölümü öğrencilerin Endüstri 4.0 Kavramsal Farkındalık Düzeylerinin orta derecede olduğu ve yaşanılan yerin bu kavrama ilişkin farkındalık düzeyini olumlu yönde etkilediği belirlenmiştir.

Anahtar sözcükler: Dijital Teknoloji**,** Ebelik, Endüstri, Farkındalık, Sağlık

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Introduction

Automation and digitalization in production systems have rapidly developed computer technologies. With this development, Industry 4.0 has taken its place in our lives by focusing on technology with the spread of production robots and internet infrastructure [1-3]. This concept is a revolution based on the adoption of information technology-based production method and applications [4]. The health industry has also developed with technological innovations in the world. Today, the need for health services has increased with the increase in the average life expectancy. Along with this need, problems such as increasing population, epidemics, pandemics, and limited resources force the health system. The health system should fulfill its function in the best way by eliminating or minimizing these problems. In this process, the digital transformation process in health has been entered by leaving traditional methods aside, keeping up with the developing technology, and producing solutions to problems with the help of technology [5, 6]. In particular, the recent COVID-19 pandemic has led to a significant loss of human life worldwide and has greatly affected healthcare services. Industry 4.0 technologies have created effective supply chain management to meet customized demands in healthcare [7]. Industry 4.0 has the potential to meet customized requirements during COVID-19-related emergency crises, and an Industry 4.0-based approach was successfully utilized during the COVID-19 pandemic [8, 9]. Furthermore, the Internet of Things, artificial intelligence, big data analytics, and 3D printing have been used extensively to combat the COVID-19 pandemic [7].

The global health sector continues to grow rapidly, and Industry 4.0 is one of the fastest-growing sectors [10]. These developments in Industry 4.0 have positively affected Health 4.0, and digital transformation has also taken place in health. With Health 4.0, people's life expectancy has been extended with improvements in the treatment and diagnosis of diseases 11. In addition, a vision of a personalized, patient-centered approach, preventive, sensitive, widespread, and participatory healthcare services has emerged [11, 12]. In the hospitals of the future, an efficient process will be measured not by the number of beds but by the correct use of technology. Hospitals will create their own future by developing technological digital investments [12]. Now, thanks to the digital transformations brought by Industry 4.0, new concepts have started to emerge in Health 4.0. Examples of these concepts include 5G, cloud, robotics, artificial intelligence, the Internet of Things, quantum computers, virtual reality, and big data 5.

Industry 4.0 is now widely used in the field of healthcare and education [13, 14]. As a result of a study, it was observed that the virtual reality simulation developed had positive effects on students' newborn care skills satisfaction levels and increased their sense of self-confidence [15]. In a study conducted on health education, A virtual field experience training program accompanied by simulation was implemented for midwifery department students who could not complete clinical practice during the pandemic period. With the application, an education model that will contribute to the provision of reliable and sustainable health services has been developed [16]. In a study, a model with an Artificial Neural Network (ANN) algorithm was used to identify problems that may occur during pregnancy at an early stage through remote pregnancy monitoring. With this model, some parameters were scored according to the determined criteria to describe the symptoms during pregnancy. These criteria include last menstrual date, nausea-vomiting, craving, appetite, body mass index, breast tenderness, urination-defecation pattern, pulse, blood pressure, body temperature, vaginal bleeding, and psychosocial status. In the study examining the effectiveness of the model, the medical records of 172 people were examined. According to the results of the study, the ANN-based model can be used to identify problems during pregnancy with an accuracy of around 78% [17]. As seen in these studies in the literature, midwives in many parts of the healthcare field also need to have knowledge about Industry 4.0 and its developmental process. In addition, it is necessary to determine the awareness level of midwives to keep up with this process. Thus, this study was conducted to determine the awareness of student midwives about Industry 4.0.

Research Questions

1.What is the level of Industry 4.0 awareness of midwifery students?

2.Is there a difference between the sociodemographic characteristics of midwifery students and their Industry 4.0 Awareness Levels?

Material Method

Population and Sample of the Research

The population of the study consisted of N=368 students enrolled in Tokat Gaziosmanpaşa University, Faculty of Health Sciences, Department of Midwifery. The minimum sample size was calculated in G*power 3.1.9 program. Accordingly, the number of samples that should be included in

the study for 95% statistical power 0.05 margin of error was calculated as 210. The study was completed with 257 midwifery students, taking into account possible losses.

Inclusion criteria: Between the dates of the study, students enrolled in Tokat Gaziosmanpaşa University, Faculty of Health Sciences, Department of Midwifery, continuing formal education and volunteering to participate in the study were included.

Dependent variables: Scores from the Industry 4.0 Awareness Scale

Independent variables: Socio-demographic characteristics of students

Data Collection

The implementation of the study was carried out between May 16, 2022, and June 20, 2022. The questionnaires were uploaded to https://docs.google.com/forms/, and the link address was delivered online via WhatsApp to the students of Tokat Gaziosmanpaşa University Faculty of Health Sciences, Department of Midwifery. An informed consent page was presented on the introduction page of the questionnaire, and the students who accepted continued the survey.

Data Collection Tools

"Socio-demographic Information Form" and "Industry 4.0 Conceptual Awareness Scale" were used to collect the data.

Sociodemographic Data Form

The form was developed in line with the literature to determine the socio-demographic characteristics of the students 18, 19.

Industry 4.0 Conceptual Awareness Scale

The Industry 4.0 Conceptual Awareness Scale is a 39-item, one-dimensional scale developed by Dogan and Baloglu (2020). The Cronbach's Alpha coefficient of the scale was found to be 0.96. Participants indicate their level of awareness for the scale on a 5-item Likert scale as "none=1, little=2, medium=3, very=4 and full=5". The lowest score is 39, and the highest score is 195. As the scores obtained from the scale increase, the awareness level of the participants increases 18. The Cronbach Alpha coefficient of the original scale was 0.96, and the Cronbach Alpha coefficient was 0.98 in this study.

Analysis of Data

The data obtained from the study were evaluated in SPSS (Statistical Package for Social Sciences) 22.0 package program. Descriptive analyses (number, percentage, mean, standard deviation, minimum, and maximum) were used in the evaluation of the data. In the study, $p<0.05$ was accepted as the significance limit. Parametric tests were used when the data conformed to the normal distribution, and nonparametric tests were used when the data did not conform. Descriptive statistical methods such as frequency, percentage, mean, and standard deviation were used to evaluate the study data.

Ethics Committee Approval

To conduct the research, the necessary permission was obtained from the Tokat Faculty of Health Sciences, and ethics committee approval (No. 158991, session no. 09, decision no. 44) was obtained from Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee. Before the participants started to fill out the questionnaire form, an informed consent form section explaining the purpose of the research was added and asked for approval. In this way, informed consent was obtained from the individuals.

Results

The findings of the research, which aim to determine the industry 4.0 awareness of midwifery students, are given in this section. The average age of students participating in the study was 21.22±1.84 (min=18, max=29) years. 31.9% of the students were 2nd-year students in the Department of Midwifery. The mean grade point average of the students, according to the quadratic system, was 3.27±1.96 (min=1.50, max=3.40). 62.6% of the students graduated from Anatolian high school, and 66.5% are currently staying in a state dormitory. 52.9% of the students have their own computers, 100% use smartphones, and 60.7% use computers. Results showed that 92.6% of the students had access to the internet where they lived. The time students spent on the internet was 5.23±2.89 (min=1, max=24) hours. 72.4% of the students did not use wearable technology, and 43.2% used media sharing and instant messaging applications (Table 1).

The relationship between some characteristics of the students and the scores obtained from the scale was analyzed. This information is given in Table 2. There was no significant correlation between the students' grades, high school graduated from, owning a computer, using a computer, internet access at the place of residence, using wearable

technology, social media accounts used, grouped grade point averages, and the scores obtained from the scale (p> 0.05). When the relationship between the place where the students stayed and the scores obtained from the scale was examined, it was determined that there was a significant difference between the scores obtained from the scale by students staying in public dormitories and students staying in private dormitories (p< 0.05). When the source of the difference was examined through post-hoc analysis, it was determined that it was between students living in private dormitories and students living in public dormitories. Accordingly, it was determined that the scores obtained from the scale by students living in private dormitories were statistically higher (Table 2).

The average score of the students on the scale is 89.98 ± 30.5 (min=39, max=195). According to the score obtained from the scale, it was determined that the students' Industry 4.0 conceptual awareness was at a medium level.

Table 1. Descriptive statistics for some characteristics

Characteristics	Avg.±SS* (min-max)	
Age	21.22±1.84 (18-29)	
Time spent on the internet	5.23±2.89 (1-24)	
Average grade	3.27±1.96 (1.50-3.40)	
	n	**%**
Year		
1.year	52	20.2
2.year	82	31.9
3.year	65	25.3
4.year	58	22.6
Students' last high school graduated from		
Regular High School	26	10.1
Vocational and Technical Anatolian High Schools	35	13.6
Anatolian High School	161	62.6
Science High School	23	9
Other	12	4.7
Student's residence		
Public Dormitory	171	66.5
With Family	48	18.7
Student House	24	9.4
Private Dormitory	14	5.4
Owns a computer		
Yes	121	47.1
No	136	52.9
Uses a smartphone		
Yes	257	100
No	0	0
Uses a computer		
Yes	156	60.7
No	101	39.3
Internet access at the place of residence		
Yes	238	92.6
No	19	7.4
Uses wearable technology		
Yes	71	27.6
No	186	72.4
Social media accounts used		
Media sharing (tiktok, instagram, snapchat, youtube)	104	40.5
Instant messaging (whatsapp, telegram, signal)	5	1.9
Social media (twitter, facebook, linkedin)	6	2.3
Media sharing and social media	111	43.2
Media sharing and instant messaging	31	12.1
Total	257	100

Table 2. The relationship between some variables and the scores obtained from the scale

Characteristics	Total points	Test value
Year		
1.year	87.03±24.5	
2.year	87.24±30.7	F:0.825
3.year	92.29±29.0	p:0.481
4.year	93.91±36.1	
Students' last high school graduated from		
Regular High School	100.80±27.9	
Vocational and Technical Anatolian High Schools	90.91±31.7	F:1.650
Anatolian High School	87.36±32.2	p:0.162
Science High School	88.26±30.37	
Other	102.33±30.3	
Student's residence		
Public Dormitory	85.12±29.3[a]	**F:5.154**
With Family	96.50±31.7	**p:0.02**
Student House	100.54±25.8	
Private Dormitory	108.85±34.8[a]	
Owns a computer		
Yes	90.77±31.6	t:0.392
No	89.27±29.5	p:0.455
Uses a computer		
Yes	92.21±31.1	t:1.457
No	86.54±29.2	p:0.314
Internet access at the place of residence		
Yes	89.45±30.4	U:1993.5
No	96.63±31.1	p:0.391
Uses wearable technology		
Yes	94.70±30.4	F:0.15
No	88.18±30.4	p:0.902
Social media accounts used		
Media sharing (tiktok, instagram, snapchat, youtube)	91.25±28.6	
Instant messaging (whatsapp, telegram, signal)	87.00±33.2	KW:2.292
Social media (twitter, facebook, linkedin)	84.50±36.1	p:0.682
Media sharing and social media	87.88±32.4	
Media sharing and instant messaging	94.80±29.1	
Grouped grade point average		
2.50 and below	79.14±31.8	KW:0.459
Between 2.50 and 3.00	89.75±26.8	p:0.633
Between 3.00 and 4.00	90.37±31.1	

F:ONE WAY ANOVA, t:independent t test, KW: Kruskal Wallis, U: Mann-Whitney U
a: There is a significant difference between variables with the same letter within the group.

Table 3. Scale total mean score and Cronbach Alpha coefficient

Scale total mean score	Cronbach Alpha coefficient
89.98 ± 30.5(min=39,max=193)	0.98

Discussion

This study aimed to determine the level of Industry 4.0 conceptual awareness of midwifery students. According to the result obtained in the research, it was determined that the Industry 4.0 Conceptual Awareness level of 247 students in the sample group was at a medium level. When the literature was examined, no research was found to determine the Industry 4.0 conceptual awareness levels of students studying in Health Sciences. Dogan and Baloglu (2020) concluded that the Industry 4.0 conceptual awareness levels of Engineering and FEAS students were at a medium level [19]. However, the average score obtained from the scale was found to be higher than in this study. The reason for this is thought to be that students in these fields are intertwined with the concept of

Industry 4.0 within the scope of the courses they take. Kaygisiz and Sipahi (2019) conducted a study to examine the Relationship Between Individual Innovation and Industry 4.0 Knowledge Levels of Generation Y University Students; when we look at the sources where the students participating in the research obtained information about Industry 4.0, it was done through a course subject and websites [20]. Isa et al. (2021) concluded that students in Malaysia have low levels of perception and knowledge about Industry 4.0. However, it was observed that students were willing to improve their knowledge and skills related to Industry 4.0 [21]. Tinmaz and Hwa Lew (2019), in a study conducted with university students in South Korea, found that the participants were not very aware of Industry 4.0 [22]. According to the findings obtained from these studies, it is clear that changes are inevitable in higher education institutions in parallel with the development of Industry 4.0 technologies.

In the study, no significant relationship was found between the grade of the students and the scores obtained from the scale ($p > 0.05$). However, it was determined that the score obtained from the scale increased as the grade level increased. Dogan and Baloglu (2020) concluded that students' Industry 4.0 conceptual awareness levels did not change significantly according to class level [19]. Yelkikalkan et al. (2019) found that the perceived benefit levels and usage behaviors of the students regarding Industry 4.0 technologies showed a significant difference according to the classes they studied, while the perceived ease of use and intention to use did not show a significant difference according to the class they studied [3]. Motyl et al. (2017) conducted a two-semester survey on 463 students at the University of Brscia, the University of Udinese, and the University of Cassino in Italy to determine the skills and expertise required for young engineers to be ready for Industry 4.0 and found that 'as the students' grade increases, their conceptual awareness levels also increase' [23]. It is thought that the increase in their awareness of the concept of Industry 4.0 as the grade level increases creates awareness of this concept within the scope of the courses they take.

Moreover, no significant relationship was found in the study between the social media accounts used by the students and the scores obtained from the scale ($p > 0.05$). Yarim and Celik (2020), in the study titled The Necessity and Role of the Teacher from the Student's Perspective in the Age of Industry 4.0, when the findings related to the question "In which ways do you access the information you use in daily life?" are examined, it is seen that students mostly access the information they use in daily life from the internet (websites, blogs, search engines, educational sites, etc.) and virtual world (Twitter, Instagram, Facebook, etc.) [24]. According to the research findings, teachers and schools, which were the most important sources of obtaining information in the past, have lost their former importance in accessing information. Students can now easily access information whenever they want through the internet. However, it is seen that they need support on how to use this information. In this context, today's teachers have a role in helping students process and use information instead of delivering it.

Results showed that there was no significant relationship between the grouped grade point averages of the students and the scores obtained from the scale ($p > 0.05$). However, it was found that the score obtained from the scale increased as the grade point average increased, and the highest score from the scale was obtained by students with a GPA between 3-4. According to the results of Dogan and Baloglu's (2020) study, it was determined that the Industry 4.0 conceptual awareness levels of university students with a GPA between 3-4 were at a higher level compared to students in other grade ranges [19].

When the relationship between the place where the students stayed and the scores obtained from the scale was examined, it was determined that there was a significant difference between the scores obtained from the scale by the students staying in public dormitories and the students staying in private dormitories ($p < 0.05$). In the post hoc analysis, it was seen that the difference was in favor of the students staying in private dormitories. In the study conducted by Isik (2022) on the Determination of Awareness of Industry 4.0 Approach from the Perspective of University Students, when the results of the Tukey Test were analyzed according to the "Industry 4. 0 knowledge" factor, there is a significant difference between staying in dormitories and staying in hostels and staying with relatives; between staying in hostels and staying in dormitories, houses and staying in their own homes; between staying at home and staying in hostels, staying with relatives and staying in their own homes; between staying with relatives and staying in hostels, houses and staying in their own homes; between staying in their own homes and staying in hostels and staying in their own homes. Accordingly, it was determined that university students' knowledge about technological tools and Industry 4.0 differed significantly according to the place of residence

variable [25]. Similar findings were found with this study.

In the study, no significant correlation was found between the scores obtained from the scale and the students' status of having a computer of their own, using a computer, having internet access at the place of residence, and using wearable technology (p> 0.05). Yıldız and Fırat (2020) conducted a study to determine the Industry 4.0 knowledge level of university students in Turkey and found that students' perceptions and attitudes towards technology were insufficient to affect their Industry 4.0 knowledge level. In addition, university students' awareness and knowledge levels about Industry 4.0 technology and its components are insufficient to catch up with the speed and technologies of the revolution we are experiencing. Moreover, university students adopt and use products and conveniences reflected in daily life but are far from the concepts and technologies that form the infrastructure [26]. In this context, it can be said that although students have used Industry 4.0 technologies and components in their lives, this does not affect their Industry 4.0 awareness.

CONCLUSIONS

The conclusion shows that the level of Industry 4.0 Conceptual Awareness of midwifery students was at a moderate level, and the place of residence of the student positively affected the level of awareness of this concept. Based on the results obtained in the study, it is recommended to study the level of Industry 4.0 conceptual awareness in different sample groups. In addition, determining the level of Industry 4.0 conceptual awareness of university lecturers and administrators should also be addressed. The course contents of higher education institutions should be revised following the developments in this field, and necessary measures should be taken to increase the awareness levels of students. To increase awareness of Industry 4.0, it can be suggested that courses on Industry 4.0 and the digital revolution should be offered, informative activities such as conferences, seminars, etc. should be increased, and professional organizations and chambers should serve in this regard with different activities.

Ethics Committee Approval: Ethics committee approval (No. 158991, session no. 09, decision no. 44) was obtained from Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee.

Informed Consent: Before the participants started to fill out the questionnaire, their informed consent was obtained with an informed consent form explaining the purpose of the study.

Disclosures: This research was presented as an abstract at the 1st International 1st National Digital World & Digital Health & Digital Midwifery Congress held on October 19-21, 2022.

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Research Limitations: Since the Industry 4.0 Awareness Scale used in the research has not yet been used in other studies in the field of midwifery, this caused limitations in the writing of the discussion section. In addition, since Industry 4.0 is a current issue, the limited knowledge of individuals in the society on the subject and the low level of awareness on this subject is another limitation of the research. The findings obtained from this research only cover the midwifery students included in the research and cannot be generalized to all students.

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