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**KNOWLEDGE AND ATTITUDE OF DENTAL PROFESSIONAL  
PROGRAM STUDENTS IN PREVENTION OF NOSOCOMIAL INFECTIONS AT  
GUSTI HASAN AMAN DENTAL HOSPITAL**

**Aurelia Marsha Denta Oktavia<sup>1)</sup>, R Harry Dharmawan Setyawardhana<sup>2)</sup>, Riky Hamdani<sup>2)</sup>, Fajar Kusuma Dwi Kurniawan<sup>3)</sup>, Rosihan Adhani<sup>2)</sup>**

<sup>1)</sup>Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin, Indonesia

<sup>2)</sup>Departement of Dental Public Health, Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin, Indonesia

<sup>3)</sup>Departement of Orthodontics, Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin, Indonesia

**ABSTRACT**

**Background:** Nosocomial infection is one of the reasons for the high morbidity rate in hospitals. Dental professional program students have a risk of contracting or transmitting infection to patients through blood, saliva, lesions, direct contact, or indirect contact when providing care. Dental professional program students need to apply standard precautions to reduce the risk of infection transmission. **Purpose:** This study aims to analyze the relationship between knowledge and attitude among dental professional program students in prevention of nosocomial infections at Gusti Hasan Aman Dental Hospital. **Methods:** This type of research is analytical observational with a cross-sectional study design. A sample of 77 dental professional program students was selected using a simple random sampling technique. Collecting data using a questionnaire concerning knowledge, attitude, and behavior in prevention of nosocomial infections. Statistical analysis using the Spearman test. **Results:** The results showed that as many as 44 people (57.14%) had good knowledge, 53 people (68.83%) had good attitude, and 71 people (92.21%) had good behavior prevention of nosocomial infection. The statistical test results showed that there was a significant relationship between knowledge and behavior to prevent nosocomial infections with a value of  $p = 0.001$  and there was a significant relationship between attitude and behavior prevention of nosocomial infections with a value of  $p = 0.001$ . **Conclusion:** Research shows the need to improve materials and monitor dental professional program students' applied of standard precautions. Good knowledge and a good attitude will be followed by good behavior in the prevention of nosocomial infections.

**Keywords:** Attitude, Dental students, Knowledge, Nosocomial infection prevention, Standard precautions

**Correspondence:** Aurelia Marsha Denta Oktavia; Faculty Of Dentistry, Lambung Mangkurat University, Veteran Street No. 128B, Banjarmasin, South Kalimantan; E-mail: [aurel.marsha51@gmail.com](mailto:aurel.marsha51@gmail.com)

**INTRODUCTION**

Hospital is one of the health service facilities that has an important role in improving public health status.<sup>1</sup> Infections obtained from hospitals due to the transmission of pathogenic microorganisms in the hospital environment are called hospital-borne infections or nosocomial infections.<sup>2</sup> Nosocomial infections can also be referred to as Health Care-Associated Infections (HAIs).<sup>3</sup> Nosocomial infection is one of the reasons for the high morbidity and mortality rates in hospitals.<sup>2</sup>

World Health Organization (WHO) states that the prevalence of nosocomial infections worldwide averages 10%.<sup>4</sup> WHO also reported that the prevalence of nosocomial infections in Indonesia reached 7.1%.<sup>5</sup> Incidence of nosocomial infections in Indonesia was

found in 2017 at Konawe Selatan Hospital with a relatively high prevalence reaching 4.4%.<sup>3</sup> Prevalence of other nosocomial infections that also occurred in Indonesia was found in 2010 in ten teaching hospitals reaching 6-16% with an average of 9.8%.<sup>6</sup> The prevalence rate was deemed to be high since it exceeded the standard limit for nosocomial incidence rates which was set at 1.5% by the Minister of Health of the Republic of Indonesia in Regulation No.129 of 2008.<sup>6</sup> The high incidence of nosocomial infections is usable to indicate importance of infection prevention efforts in hospitals.<sup>1</sup>

Infection Prevention and Control (IPC) is necessary among dental professional program students to reduce the risk of infection transmission by applying standard precautions as outlined in Regulation No. 27 of

2017 by the Minister of Health of the Republic of Indonesia concerning Infection Prevention and Control Guidelines in Health Service Facilities.<sup>7</sup> Dental professional program students have a risk of contracting or transmitting infection to patients through blood, saliva, lesions, direct contact, or indirect contact, such as through dental tools, contaminated environmental surfaces, or air when providing care at healthcare facilities.<sup>8-10</sup> The use of dental tools that have a high risk of causing nosocomial infections, such as high-speed handpieces, three-way syringes, ultrasonic scalers, and high-volume suction, because it facilitates the spread of aerosols containing the patient's blood and saliva through the air.<sup>11</sup> Blood and saliva are common routes of transmission for pathogenic microorganisms to the dental medical staff.<sup>9</sup> According to Deogarde's survey in 2016, showed 18.3% of dental students had aerosol splashes in their eyes.<sup>9</sup> Hema's research in 2017 obtained data showing that as many as 24.5% of dental postgraduate students confirmed positive for *Methicillin-resistant Staphylococcus aureus* (MRSA) while studying at the Dental Colleges and Hospitals of Bengaluru in India.<sup>12</sup> Senok's research in 2020 stated that as many as 37.5% of dental clinic clerkship students were confirmed to suffer from *Methicillin-Resistant Staphylococcus aureus* (MRSA), which is a common cause of nosocomial infections worldwide, while studying at Hamdan Bin Mohammed College of Dental Medicine, United Arab Emirates.<sup>13</sup>

One of the causes of nosocomial infections is a lack of knowledge about IPC.<sup>4</sup> Knowledge influences a person's attitude and application of that attitude will manifest itself in the form of action.<sup>14</sup> According to Dokky and Moheb's research in 2021, postgraduate students in dentistry at the Faculty of Dentistry, Cairo University, had an average knowledge of 63.72%, an average attitude of 50.52%, and an average practice on prevention and infection control of 60.42%, according to the level of knowledge and attitude they had.<sup>15</sup>

Gusti Hasan Aman Dental Hospital is a teaching hospital located in South Kalimantan Province. The dental professional program students, which is currently studying at Gusti Hasan Aman Dental Hospital, also plays an active role in providing dental and oral health services in the integration department of the poly. The integration polyclinic at Gusti Hasan Aman Dental Hospital consists of polyclinics for oral disease, periodontics, conservation, pedodontics, oral surgery, orthodontics, and prosthodontics. The results of a preliminary study by researchers at Gusti Hasan Aman Dental Hospital obtained data that dental professional program students had been given the material on IPC only once at their general clerkship before participating in providing dental and oral health services to patients. The results of monitoring reports and interviews with IPC committee in charge at Gusti Hasan Aman Dental Hospital stated that the dental professional program student had the lowest level of compliance with hand

hygiene and the use of Personal Protective Equipment (PPE) compared to other professions and also had a low level of implementation of decontamination of patient equipment, so that did not reach the set target. This study aimed to analyze the relationship between knowledge and attitude among dental professional program students in the prevention of nosocomial infections at Gusti Hasan Aman Dental Hospital.

## METHODS

The study has received permission from the Faculty of Dentistry, Lambung Mangkurat University ethics committee under approval number 044/KEPKG-FKGULM/EC/III/2023. This kind of research is analytical observational with a cross-sectional study design. The research was conducted at Gusti Hasan Aman Dental Hospital during January–Mei of 2023. The research population is 280 dental professional program students from the classes of 2020, 2021, and 2022. A simple random sampling technique was used to determine the sample from the study population to obtain a total sample of 77 dental professional program students. The study included dental professional program students from the classes of 2020, 2021, and 2022 who had received material about IPC during their general clerkship at Gusti Hasan Aman Dental Hospital. Dental professional program students who were sick, on leave, or who did not complete their identity or questionnaire were excluded from this study.

The variables of this study consisted of independent variables (knowledge and attitude) and dependent variables (behaviors) concerning the prevention of nosocomial infections. Sampling data was obtained by filling out a questionnaire via Google Form with direct monitoring by the researcher. The questionnaire concerning knowledge, attitudes, and behavior in preventing nosocomial infections contains 12 questions concerning components of standard precautions in the form of hand hygiene, personal protective equipment (PPE), decontamination of patient care equipment, health protection for staff, respiratory hygiene/cough etiquette, and safe injecting practices. The questionnaire was tested for validity and reliability before being used. Questionnaire data obtained from research results were then processed and analyzed by researchers. The Spearman test will be used to statistically assess the relationship between the independent and dependent variables.

## RESULTS

### Respondent Characteristics

The research's findings included information on the respondents' gender characteristics as well as data on their knowledge, attitudes, and behavior on the prevention of nosocomial infections from filling out the questionnaire. The research results are described as follows:

**Table 1.** Distribution of Gender Characteristics of Dental Professional Program Students

Dental Professional Program Students		
	N	%
<b>Total</b>	77	100
<b>Gender</b>		
Male	15	19.48
Female	62	80.52

The gender frequency distribution above shows that of the 77 respondents, the female gender distribution was mostly owned by 62 people (80.52%).

**Knowledge, Attitude, and Behavior in Prevention of Nosocomial Infections**

**Table 2.** Distribution of Knowledge, Attitude, and Behavior in Prevention of Nosocomial Infections among Dental Professional Program Students

Dental Professional Program Students		
	N	%
<b>Total</b>	77	100
<b>Knowledge</b>		
Good	44	57.14
Average	33	42.86
<b>Attitude</b>		
Good	53	68.83
Average	24	31.17
<b>Behavior</b>		
Good	71	92.21
Average	6	7.79

The research results show that the distribution of knowledge concerning the prevention of nosocomial infections in the good category was 44 people (57.14%), attitude concerning the prevention of nosocomial infections was in a good category by 53 people (68.83%), and behavior in the prevention of nosocomial infections was in a good category by 71 respondents (92.21%).

**Relationship Between Knowledge, Attitude and Behavior in Prevention of Nosocomial Infections**

The relationship between knowledge, attitudes, and behavior in prevention of nosocomial infections among dental professional program students was analyzed using the Spearman test. Spearman test results can be seen as follows:

**Table 3.** Relationship Between Knowledge, Attitudes, and Behavior in the Prevention of Nosocomial Infections among Dental Professional Program Students

Variable	Behavior		Total	p value	r
	Good N(%)	Average N(%)			
<b>Knowledge</b>					
<b>Good</b> N(%)	42 (95.45%)	2 (4.55%)	44 (100%)	0.001	0.357
<b>Average</b> N(%)	29 (87.88%)	4 (12.12%)	33 (100%)		
<b>Attitude</b>					
<b>Good</b> N(%)	51 (96.23%)	2 (3.77%)	53 (100%)	0.001	0.386
<b>Average</b> N(%)	20 (83.33%)	4 (16.67%)	24 (100%)		

The results of statistical analysis revealed that there was a significant relationship between knowledge and behavior in prevention of nosocomial infection among dental professional program students with a weak relationship strength based on a significance value of 0.001 ( $p < 0.05$ ) and a correlation coefficient ( $r$ ) of 0.357. The results of the analysis also revealed that there was a significant relationship between attitudes and behavior in prevention of nosocomial infections among dental professional program students with a weak relationship strength based on a significance value of 0.001 ( $p < 0.05$ ) and a correlation coefficient ( $r$ ) of 0.386.

**DISCUSSION**

**Knowledge concerning Prevention of Nosocomial Infections**

Knowledge is the result of the respondent's knowing after sensing a particular object.<sup>16</sup> The intensity of attention and perception of the results of sensing an object are different for each person, so it will affect the results of knowledge between them.<sup>16</sup> The results showed that the respondents' knowledge concerning the prevention of nosocomial infections was mostly in the good category. The results of this study are in line with Utami's research in 2019, which stated that as many as 67.2% of dental professional program students at the Andalas University Dental Hospital had high knowledge of infection control.<sup>14</sup> This research is also consistent with Zahraniarachma's research in 2020, which showed 88.9% of young dentists Unimus Dental and Oral Hospital had high knowledge about preventing nosocomial infections.<sup>17</sup> Good knowledge concerning the prevention of nosocomial infections among dental professional program students is one of the reasons for the high level of education.

Educational intervention is critical for establishing high standards in infection prevention and control so that understanding and adherence to implementation, as well as the development of positive attitudes that arise, can provide significant benefits in controlling the spread of infection.<sup>9</sup> The effort to prevent nosocomial infections carried out by Gusti Hasan Aman Dental Hospital as an educational institution for candidate dentists is carried out by providing IPC material by the IPC committee at the time of public sanitation, so that dental professional program students will be accustomed to thinking logically in carrying out the efforts to prevent infections by applying standard precaution when working to provide health services.

#### **Attitude concerning Prevention of Nosocomial Infections**

Attitude is a person's assessment of an object after knowing the object.<sup>18</sup> The results showed that the attitudes of respondents concerning the prevention of nosocomial infections were mostly in the good category. The findings of this study were consistent with Palingga's research in 2020 which found that 66.4% of young dentists at the Dental Specialty Hospital in South Sumatra Province had a good attitude concerning standard precautions as a form of prevention against infection.<sup>7</sup> This study was also in line with the research conducted by Djawan in 2022 which presented that as many as 79.5% of the Faculty of Medicine's professional students at the University of Nusa Cendana showed a positive attitude concerning the prevention of nosocomial infections.<sup>5</sup> The good attitude of dental professional program students is due to the knowledge concerning the prevention of nosocomial infections obtained during clinical clerkship, so this knowledge forms awareness in determining the attitude chosen.

Attitudes are also formed from emotions, which underlie the emergence of behavior.<sup>16</sup> Another factor is the experience of a situation or object that leaves a certain impression, either good or bad, so that a firmly ingrained impression becomes the basis for forming attitudes.<sup>19</sup> The attitude of a person suggests a closed response to certain stimuli or objects that are linked to their emotional factors, such as agreeing or disagreeing, being happy or unhappy, feeling good or feeling bad.<sup>20</sup> Positive impressions from the experience of knowing that infection prevention will affect someone's emotions, so that it affects them have an impact on positive attitudes when finding similar experiences to deal with. Monitoring factors that are carried out properly and continuously can also increase a person's self-awareness to apply standard precautions at any time.<sup>21</sup> Monitoring by the IPC team and nurses on duty at each integration poly will influence the attitude of dental professional program students so that they are aware that the application of standard precautions must be carried out at any time.

#### **Behavior in Prevention of Nosocomial Infection**

Health behavior is all of a person's activities that can be observed or not observed and affect health care.<sup>16</sup> The findings revealed that respondents' behavior in preventing nosocomial infections was mostly in the good category. The study's findings were compatible with Hutajulu's research from 2021 which showed that as many as 80% of clinical clerkship students at Prima Indonesia University Dental Hospital had good practice in preventing cross-infection.<sup>22</sup> The results of another study by Djawan in 2022 at the Faculty of Medicine, University of Nusa Cendana also stated that as many as 85.2% of medical professional students have good behavior in infection prevention.<sup>5</sup>

The behavior toward prevention of nosocomial infections among dental professional program students was mostly in the good category because they had acquired knowledge about the IPC material provided by the IPC committee at Gusti Hasan Aman Dental Hospital, so new behaviors emerged in the process.<sup>16</sup> Another factor that reinforces behavior according to Green's theory of change behavior is the presence of Standard Operating Procedures (SOP).<sup>18</sup> SOP is a written regulation that regulates every activity up to the completeness of dental professional program students while providing services to patients in an effort to prevent infection in the Gusti Hasan Aman Dental Hospital environment so that it can be complied with. The monitoring factor also plays a role in increasing motivation which if done properly and continuously can increase one's self-awareness so that it shapes one's behavior.<sup>18,21</sup> Gusti Hasan Aman Dental Hospital conducts monitoring once a month through the IPC team and nurses on duty at each integration poly to determine compliance with hand hygiene, use of Personal Protective Equipment (PPE), and decontamination of patient care equipment among dental professional program students so that it becomes a motivation to comply with regulations for the prevention of nosocomial infections. It is supported by the results obtained from observations by researchers, which revealed that 81.82% of dental professional program students at Gusti Hasan Aman Dental Hospital have good behavior in preventing nosocomial infections.

#### **Relationship Between Knowledge and Behavior in Prevention of Nosocomial Infections**

The results showed that most respondents who had good knowledge also had good behavior in the prevention of nosocomial infection. The findings of this study were consistent with Utami's research in 2019 which showed that 80.5% of dental professional program students had high knowledge and good practice towards infection control at the Andalas University Dental Hospital.<sup>14</sup> It was also supported by Zahraniarachma's research in 2020 which found that as many as 89.6% of young dentists at Unimus Dental and

Oral Hospital have high knowledge and high behavior as well.<sup>17</sup>

The results of the statistical analysis revealed that there was a significant relationship between knowledge and behavior in prevention of nosocomial infection among dental professional program students. The results of this study are aligned with Utami's research in 2019 which shows that there was a significant relationship between knowledge and behavior toward infection control at the Andalas University Dental Hospital.<sup>14</sup> The results of this study are also aligned with Zahraniarachma's research in 2020 which showed that there was a significant relationship between knowledge and behavior to prevent nosocomial infections among young dentists at Unimus Oral and Dental Hospital.<sup>17</sup>

The predisposing factor for the formation of behavior according to Green's theory is the knowledge factor.<sup>16</sup> Dental professional program students who have good knowledge about prevention of nosocomial infections and are accustomed to applying standard precautions will also have good behavior in prevention of nosocomial infections. According to Kurt Lewin's theory, behavior is not only formed as a result of responses and stimuli, it is also the result of interactions between self-personality and the environment.<sup>16</sup> Self-personality factors and environmental influences that influence nosocomial infection prevention behavior among dental professional program students are habit factors and experience factors.<sup>16</sup>

Dental professional program students who are accustomed to carrying out complete hand hygiene steps according to WHO recommendations, using complete PPE, and carrying out a complete series of decontamination of treatment equipment for patients are dental professional program students who have prevention of nosocomial infection in a good category. Habit is a supporting aspect of human action that takes place automatically without planning and is permanent as a result of the habitual result of an action that is performed repeatedly over a long time.<sup>16</sup> Experience factors that influence the behavior of dental professional program students can come from personal experience as well as others' personal experience. Personal experience among dental professional program students shows that by routinely performing hand hygiene, using PPE, and consistently decontaminating patient care equipment completely, operators and patients will avoid contracting diseases that may be carried by operators during treatment or diseases from patients who come from outside environments, as well as reprimands or sanctions for violations from the supervising lecturer and the Gusti Hasan Aman Dental Hospital.

Based on the researchers' observations, there were still some respondents who were incomplete in using PPE, such as not using standard headcaps or masks, so they received a warning from the supervising lecturer on duty at the integration poly. Based on WHO theory, the experience of other people can occur when a person

gains knowledge as a result of seeing other people's experiences so that the knowledge possessed is not that person's personal property.<sup>18</sup> While carrying out hand hygiene steps, the researchers also found that there were dental professional program students who followed their colleagues in carrying out hand hygiene steps so that they could carry out hand hygiene steps according to WHO guidelines. The knowledge gained will be better stored in memory if it is learned repeatedly.<sup>18</sup>

### **Relationship Between Attitude and Behavior in Prevention of Nosocomial Infections**

The results showed that the majority of respondents who had a good attitude also had good prevention of nosocomial infections. Results of this study align with Utami's research in 2019 which found that the highest percentage, as many as 71.4% of respondents, had a positive attitude and also had good actions towards infection control at Andalas University Dental Hospital.<sup>14</sup> The findings of this research were similarly consistent with Djawan's research in 2022 which stated that as many as 72.2% of the Faculty of Medicine's professional students at the University of Nusa Cendana had a positive attitude and good behavior in the prevention of infection.<sup>5</sup>

The results of the statistical analysis revealed that there was a significant relationship between attitudes and behavior in prevention of nosocomial infections by dental professional program students. The results of this study were consistent with Utami's research in 2019, which presented that there was a significant relationship between attitudes and practices among dental professional program students at Andalas University Dental Hospital.<sup>14</sup> This study also had the same results as those found in Djawan's research in 2022, which states that there was a significant relationship between attitudes and behavior in the prevention of nosocomial infections in medical students at Nusa Cendana University.<sup>5</sup> Rao's research in 2023 is also in line with this study, which states that there was a relationship between attitudes and infection prevention behavior in the dental health team at the Islamic International Dental Hospital.<sup>23</sup>

According to Bloom's theory, attitude is one of the domains of behavior formation.<sup>16</sup> Green's theory also stated that attitude is a predisposing and reinforcing factor in the formation of behavior.<sup>16</sup> Attitude as one of the shapers of behavior has an important role in determining the behavior taken among dental professional program students in carrying out the prevention of nosocomial infection. Several factors influence the change in attitude into action, in addition to the attitude that already exists in the personality of the person himself.<sup>16</sup> Motivation caused by external factors is one of them.<sup>16</sup> According to the WHO, attitudes will manifest into actions depending on one's current situation, one's own experiences, and other people's experiences.<sup>16</sup> These factors are stimuli that

influence the formation of motivation among dental professional program students because they certainly have different experiences from each other. The existence of SOP and monitoring by the IPC team and nurses who guard each integration poly for the prevention of nosocomial infection also influence attitudes and actions taken in the prevention of nosocomial infection. Attitudes are also formed from the existence of beliefs, inclinations, emotions, and personal experiences towards an object so that they underlie the emergence of behavior.<sup>16,19</sup> The good attitude of dental professional program students is caused by a good impression of nosocomial infection prevention behavior, so emotions and awareness arise based on positive intentions to always apply measures to prevent nosocomial infections according to that impression.

Personal experience factors also play a role in the process of forming a person's attitude so that it influences the behavior given. Dental professional program students who have good experience performing standard precautions will have an impression of this, so they intend to continue to do so. Based on interviews with respondents, dental professional program students routinely perform complete and consistent decontamination of patient care equipment at the Gusti Hasan Aman Dental Hospital. They find it practical because the tools and materials for decontamination preparation are fully available at the dental hospital, so they avoid warnings not to decontaminate equipment. This causes dental professional program students to have a good impression of the SOP concerning equipment decontamination that must be carried out at Gusti Hasan Aman Dental Hospital and choose to routinely carry out complete equipment decontamination. Green's theory also supports the statement that the SOP for decontamination of patient care equipment developed by Gusti Hasan Aman Dental Hospital is a reinforcing factor in preventing nosocomial infections.<sup>18</sup> Dental professional program students certainly have different experiences from one another, existence of SOPs, and monitoring by the IPC team on measures to prevent nosocomial infections also influence attitudes and behaviors taken to prevent nosocomial infections.

The results of the study also revealed that the IPC team had an important role in increasing knowledge, attitude, and behavior in preventing nosocomial infections at Gusti Hasan Aman Dental Hospital. Good knowledge and a good attitude will be followed by good behavior in the prevention of nosocomial infections. Improving the delivery of PPI materials by adding regular delivery of materials at least every 3 or 6 months and routine monitoring of the application of standard precautions among dental professional program students is very necessary considering that they are always faced with the risk of infection any time and with each poly shift change. This will improve the quality of healthcare delivery and protect the dental team and patients from

various hospital-acquired infections due to the transmission of pathogenic microorganisms in the hospital environment.

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