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Validity and Reliability Testing: Contextual Standard Precautions Questionnaire Tool

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ABSTRACT

To determine validity and reliability of the modified contextual tool for assessing the compliance of standard precautions in health care Workers of Karachi. The study was carried out at three Tertiary care hospitals in Karachi, The Aga Khan University, Dow University Hospital and Hill Park General Hospital, from January 2019 to April 2019. A methodological exploratory study was carried out in health care hospitals of Karachi. Data was collected through a modified tool. A panel of eleven experts evaluated the tool for its validity and content. The questionnaire showed to be consistent and secure. The validity and reliability of the questionnaire was confirmed by a Cronbach's alpha ($\alpha=0.73$) with a coefficient for relevancy 0.98 and clarity 0.99. The contextual tool for standard precautions has acceptable content validity. It can help the researchers develop sustainable solutions aimed at patient and professional safety, focusing on compliance with standard precautions. Therefore, it should be used to evaluate factors associated with the compliance of SPs.

INTRODUCTION

Hospital-Acquired Infections (HAIs) is a crucial concern of healthcare professionals (HCPs) affecting a large number of populations globally. According to WHO, 7.1 million cases of HAIs occur each year. The prevalence of HAI is more in developing countries (2-20%) as compared to the developed countries (5-10%) (World Health Organization, 2011). It has become a top priority of the developing countries to address this alarming issue and needs more attention. Therefore, WHO has published guidelines for infection control in healthcare systems. Infection Controls are the practices used in health care setting to prevent or inhibit the spread of micro-organism from patient to patient and health care workers. HAIs are infections caused by microorganisms during treatment or stay in a health care setting. A patient could gain HAI due to various reasons, including; patient's age, immunity, presence of co morbidity and any underlying diseases. It's important, which could lead to further complications like nosocomial infections, as well as Hospital Hazards such as Needle Stick injury etc (Kohn *et al.*, 2003). A study conducted by Hassel in 2016 mentioned that the Centre of Disease Control and Prevention (CDC) presented a statement that Health Care Associated Infections (HCAIs) can be prevented with the help of the standard precautions (SP). SPs include proper hand hygiene, use of personal protective equipment (PPE), use and disposal of sharps, patient placement in patient's environment including linen and waste management (Hessels *et al.*, 2016). However, studies show that Knowledge regarding SPs, Adequate training, Support from the management for the compliance of SPs, perceived barriers (barriers in performing any procedures, Busy working hours, and

offensive for the patients), and the senior nurses influence can affect the compliance with SPs (D'Alessandro *et al.*, 2014; Sahiledengle *et al.*, 2018; Wolkewitz *et al.*, 2017; Zarb *et al.*, 2012).

Among the HCPs, Doctors and Nurses are most prone to HAIs because of their direct contact with the patients, therefore they need to be well aware of the importance of SPs and follow them strictly. In view of the significance, an integrative review done to identify tools available relating to the factors associated with the compliance of SPs confirmed that none of the tools available or tried in Pakistan were completely fulfilling the aim and addressing all the factors associated. Hence, a modified structured questionnaire was adopted from Gershon and Kermode (Gershon *et al.*, 1995; Kermode *et al.*, 2005). Originally the tool consisted 11 sections. It was further modified according to the relevancy with the study and a few questions were merged making it easier and simpler for the respondents. Modified tool consisted 119 questions in 10 separate sections which included questions regarding demographic factors, Organizational and Psychosocial factors associated with the Compliance of SPs.

The purpose of this study was to determine the validity and reliability of the modified questionnaire to measure the factors associated with the compliance of SPs.

MATERIALS AND METHODS

The validity and reliability testing was done as a part of larger study, determining the factors associated with the compliance of SPs among HCPs in three different types of tertiary care hospitals Karachi, Pakistan. The parent study was approved by the Ethical Review Committee (ERC) of a Joint Commission International Accredited

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(JCIA) tertiary care hospital in Karachi. Request for the expert opinion was made through official emails, Consent for data collection was also obtained. Confidentiality was ensured through the use of code numbers on questionnaires rather than use of name, which reveals identity. All the information regarding the study was provided to the participants before taking consent to ensure their right of self-determination.

Data was collected by a modified structured questionnaire adopted from Gershon & Kermode (Gershon *et al.*, 1995; Kermode *et al.*, 2005). The questionnaire developed by Gershon and colleague in 1995 later on modified by Kermode and colleagues in 2005 (Gershon *et al.*, 1995; Kermode *et al.*, 2005). The permission for using the modified questionnaire was taken from Dr. Kermode. Reviewed Structured Questionnaire (RSQ) was further modified according to the relevancy of the study. The original questionnaire was simplified in language to make it easier for respondents and the questions were modified for doctors and registered nurses. The repetitive and irrelevant questions were removed and a few were merged to concise the RSQ. The original tool was limited to HIV/AIDS and Hepatitis B, hence other diseases were added to some of the questions where needed. Moreover, in section 4, five questions were added regarding hand hygiene which are important for the study but were missing in the original tool. Similarly, two questions were added regarding transmission of microorganisms in section 6 and three questions were added regarding other PPE's in section 9. The questions asked the respondents to rate on a multiple Likert scale of one to three or one to five.

After making the above-mentioned modifications the RSQ was verified by experts to check its relevancy. Furthermore, for content validation a panel of 11 experts was selected, which included an Infection Control Chair, Infection Control manager, Infection Control Nurse, Assistant Dean of Clinical, Senior Clinical Instructor, Associate Professor and Consultant of Emergency Department, Associate Professor and Consultant of Intensive Care Unit, Resident of Emergency Department, Assistant Head Nurse Emergency Department, Clinical Nurse Specialist Intensive Care Unit and Emergency

Department Nurse. The criteria used for the expert review were “relevance of the questions” and “clarity and appropriateness of language for target population”. A rating scale was created for the criteria according to the guidelines (Polit & Beck, 2020). Both the scales were four-point Likert scales whereby 1 = not relevant or not clear, 2 = somewhat relevant or clear, 3 = quite relevant or clear and 4 = highly relevant or very clear. Lastly, the experts were asked to give suggestions and rate on both the scales with explanation. All the ratings given by the experts were critically evaluated and their comments and suggestions were incorporated into the questionnaire.

The Content Validity Index was calculated after receiving the feedback from the experts showing result of 0.98 and 0.99 for relevancy and clarity respectively. For assessing the internal consistency of the questionnaire, the most commonly used approach Cronbach's alpha was used (Polit & Beck, 2020). The Cronbach's alpha was calculated for each section which ranged between 0.56 and 0.85 as well as the Mean Cronbach's alpha was 0.73. The researcher maintained the quality of data by checking the questionnaire before taking the questionnaire from the participants and filling any missing data. For the better quality of data, the data was entered twice in the SPSS version 20 for minimizing the chances of error. In addition, the data cleaning was done for further minimizing the chances of error.

RESULTS AND DISCUSSION

In total, a sample of 10 HCPs was used to test reliability of the tool. Among the participants 64% were Registered Nurses and 36% were Doctors. The mean age of the participants was 43years. 54% of the participants were male and 46% were female. Among the experts, 36.2% belonged to the Emergency department, 27.3% were from Infection control department, 18.2% from ICU and 18.2% were from School of Nursing and Midwifery (SONAM). The CVI of the tool was calculated after the modifications, based on the rating of experts which came out to be 0.98 for “relevance” and 0.99 for “clarity” overall. Each section's CVI was calculated separately as well as shown in table 1.

Table 1: Content Validity Index

Content Validity Index	Relevancy	Clarity
Demographics and Other Information	0.99	1.00
Occupational Exposure	0.99	1.00
Views about Risk	0.87	0.95
Standard Precautions Compliance	0.99	0.99
Knowledge about HIV AIDS Transmission	0.98	0.98
Knowledge about Blood Borne Virus Transmission in Hospitals	1.00	0.99
Knowledge and Training regarding Standard Precautions	0.99	0.99
Attitude of Health Care Workers while caring for patients with Blood Borne Diseases	1.00	1.00
Work Place Safety	0.99	0.99
Reason for Unsafe Practices	1	1
Overall	0.98	0.99

As shown in the above-mentioned table, the relevance and clarity of Section 1 – “Demographics and Other Information” was 0.99 and 1.00 respectively. Section 2 – “Occupational Exposure” showed similar result. Whereas in section 3- “Views about Risk” the relevance was 0.87 and clarity 0.95. In Section 4 – “Standard Precautions Compliance” the relevance and clarity came out to be 0.99 each and in Section 5 – “Knowledge about HIV AIDS Transmission” was 0.98 each. The relevance and clarity of Section 6 – “Knowledge about Blood Borne Virus Transmission in Hospitals” was 1.00 and 0.99 respectively. Moreover on further assessment the result of relevance and clarity of Section 7 – “Knowledge and Training regarding Standard Precautions”, Section 8 – “Attitude

of Health Care Workers while caring for patients with Blood Borne Diseases”, Section 9 – “Work Place Safety” and Section 10 – “Reason for Unsafe Practices” was 0.99, 1.00, 0.99, 1 each respectively.

For assessing the internal consistency of the questionnaire, the most commonly used approach is Cronbach’s alpha. The normal value for Cronbach’s alpha is between 0 and 1, in which higher the value suggests higher internal consistency (Polit & Beck, 2020). The questionnaire content validity was checked by the student of Master of Science in nursing in 2011 (Farid, 2011).

Table 2 below shows the Cronbach’s alpha for each section of questionnaire.

Table 2: Reliability

Internal Consistency	Cronbach’s alpha
Views about Risk	0.56
Compliance with Standard Precautions	0.85
Knowledge about Blood Borne Disease Transmission	0.62
Knowledge and Training regarding Standard Precautions	0.84
Gloves training	0.65
Workplace Safety	0.82
Availability of Personal Protective equipment	0.72
Reason for unsafe practices	0.77
Mean internal consistency of the tool	0.73

Cronbach’s alpha was calculated for the internal consistency of each section which ranged between 0.56 and 0.85. The highest Cronbach’s alpha was 0.85 of section “Compliance with Standard Precautions” whereas

lowest value was 0.56 of section “Views about Risk”. The Mean internal consistency of the tool was also calculated which resulted 0.73.

Table 3: Reliability in different organization

Internal consistency	Cronbach’s Alpha		
	JCIA hospital	Semi Government Hospital	Private and Panel Hospital
Views about Risk	0.62	0.76	0.60
Compliance with Standard Precautions	0.89	0.81	0.82
Knowledge about Blood Borne Disease Transmission	0.65	0.58	0.57
Knowledge and Training regarding Standard Precautions	0.81	0.80	0.69
Gloves training	0.63	0.60	0.68
Workplace Safety	0.80	0.90	0.85
Availability of Personal Protective equipment	0.67	0.61	0.63
Reason for unsafe practices	0.81	0.80	0.73
Mean internal consistency of the tool	0.82	0.82	0.80

Table 3 showing the stratification of reliability according to the different organizations. Out of nine modules only four modules internal consistency is similar (Mean internal consistency of the tool, Availability of Personal Protective equipment, Gloves training, Compliance with Standard Precautions). While other Knowledge and Training regarding Standard Precautions, and Workplace

Safety remain very different from each other.

Discussion

The study attempted to test validity and reliability of the tool for assessing compliance of SPs in HCPs. The modifications done in the tool proved to be a very fruitful decision as it improved the tool according to the relevance.

The questions were simplified for easy understanding and some questions were modified to meet the contextual requirements. Moreover, some new questions were added that were absent in the original tool. The end result was an easy, understandable, and relevant tool.

The validity and reliability test are important indicators of quality measurement. The final CVI of 0.98 for relevance and 0.99 for clarity is an excellent CVI according to the literature and evidence that supports the validity of the tool. It ensures that the tool measures what was intended to be measured (Dikko, 2016; Heale & Twycross, 2015).

The most commonly used measure of internal consistency is the computation of Cronbach's alpha. A higher value of the Cronbach's alpha indicates a higher level of reliability, thus a higher precision of measurement by the tool (Heale & Twycross, 2015; Bonett & Wright, 2015; Cho & Kim, 2015). Our study also resulted in a good reliability coefficient. The computed Cronbach's alpha of the tool was greater than the accepted value of 0.70. However, there is a scope of improving the reliability which was affected by the "Risk taking by the health professionals Module". According to literature risk is a very subjective component which cannot be accurately measured since the calculated risk varies from individual to individual. Moreover, it also changes according to situation and time (Kimberlin & Winterstein, 2008). Hence change of value is inevitable.

Establishing validity and reliability for the tool to assess standard compliance has imperative implications for registered nurses and doctors. Since infectious diseases are a risk to the patients as well as HCPs, strict practice of SPs is required to control and prevent this ongoing threat. With the use of this modified tool that's valid and consistent can ensure accurate assessment of compliance with SPs. However, we have limitations of our study. Our participants were all fluent in English therefore the tool is not translated in Urdu which is the common language in Pakistan. The Tool can be translated and tested for future researchers. Moreover, our sample size is small. Hence, a larger sample size can be used in future studies. In the current study the gloves training and HCPs views about risk stayed at lower score. For which further qualitative study can do better response in assessing the reason behind it. We used only CVI and internal consistency to assess the tool but other methods can also be employed such as Inter-rater reliability, Test-retest reliability, face validity and criterion validity to strengthen and support the findings (Dikko, 2016; Bonett & Wright, 2015; Bolarinwa, 2015). Nevertheless, our Study shows valuable results on the topic of SPs, which is very significant in ensuring the safety of HCPs.

When the reliability of the modules was stratified showed only four modules are having similar reliability, when two modules variability stayed very different to each other, showing the health setting of the study if different then the internal consistency is also different. In this study the three setting re very much different from each other. Therefore, researcher need to be little cautious in

combining reliability of all of them together.

CONCLUSION

This study is showing that "CONTEXTUAL STANDARD PRECAUTIONS QUESTIONNAIRE TOOL" is one of a good tool to collect the data as it is having high validity and reliability. However, one need to be careful of not combining the data to show overall results as the data setting might be diverse in their behavior. This study recommend that tool should be always pilot test before the use of this tool in diverse population or study setting.

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