



Knowledge and Practices Regarding Standard Precautions for Infection Control Among Nurses Working at a Public, Tertiary Care Hospital Islamabad, Pakistan

Ms. Samina Yasmeen¹, Tazeen Saeed Ali², Wardah Khalid³, Ms. Zohra Kurji⁴, Mr. Shair Muhammad Hazara⁵, Mr. Shahzad Bashir⁶

¹MSN (AKU), PRN BSN, RM, RN, Assistant Nursing Instructor, College of Nursing, Holy Family Hospital Rawalpindi; ²Postdoc, PhD in Health Sciences, MSc Epidemiology, RM, RN, Professor, Assistant Dean Research & Graduates Studies, SONAM, Department of CHS, Aga Khan University Stadium Road Karachi, Pakistan; ³MBBS, MS Epi & Bio, Aga Khan University Stadium Road Karachi, Pakistan; ⁴MSN, RM, RN, Associate Professor, Aga Khan University, SONAM-Karachi; ⁵MSBE (DUHS), MSPH (HSA), Post RN. BSN, Post Basic Diploma in Pediatric, RN, Lecturer, College of Nursing, Pakistan Institute of Medical Sciences (PIMS), Islamabad; ⁶MSN (DUHS), Post RN BSN, Post Basic Diploma in CHN & Dip. Card. RN., Assistant Professor & BSN Coordinator, Institute of Nursing, Jinnah Sindh Medical University-Karachi.

ABSTRACT

Introduction: To protect patients and healthcare providers from healthcare-associated infections (HAIs), standard precautions have been promoted universally. Nurses are the forefront force in patient care; therefore, evidence-based and up to date knowledge and practices can play a vital role in helping nurses apply standard precautions (SPs).

Methods: The analytical cross-sectional study design was used. Through purposive sampling, the data were collected from 320 nurses, via, a self-administered questionnaire, from April to May 2017, from a public tertiary level hospital in Islamabad. The validity and reliability of each section was established. Mean and standard deviation were computed for continuous variables' whereas; frequencies with percentages were calculated for categorical variables. The Multiple linear regression was applied for inferential statistics, maintaining 95% CI for important associations.

Results: Out of 320 participants, the mean age of the participants were 33.04 ± 6.65 years. More than half of the study participants (66.88%) were females' whereas 33.13% were male nurses. The mean knowledge and practice were 19.6 ± 3.3 and 13.00 ± 5.23 , respectively, with a maximum score of 24 and 25. The results showed that the knowledge of the participants were better as compared to practices, though, in general knowledge they were reported as relatively deficient. Continuing training sessions on SPs revealed a significant 0.66 (95% C.I.; 1.07, 3.67) relationship with the knowledge score in the final model. Practices were found to be better. Similarly, the Hep. B vaccinated nurses showed a positive impact of 1.49 (95% C.I.; 0.07, 2.91) on the level of practices in MLR.

Conclusion: The overall level of knowledge and practices among female nurses regarding standard precautions were inadequate. The study findings highlighted the need to continue intensive and in-service trainings sessions on SPs of infection control, using innovative approaches.

Key Words: Infection Control, Knowledge, Attitudes, Practices, Nurses, Public Tertiary Care, Hospital

INTRODUCTION

Healthcare-associated infections (HAIs) are the most striking global health problem, leading to a significant burden among patients, healthcare systems, and health care providers (HCPs). HAIs refer to those infections which are acquired during the process of hospital care and are absent on admission.^{1,2,3} With regard to the patients, it claims that the rate of

HAI is 25% to 40% high globally.^{1,3} In developed countries, around 5% -10% admitted patients acquire HAIs at any given time in acute care hospitals, whereas, in developing countries, this risk is 2-20 times higher.³ Like, in Pakistan, around 1,170,561 are reported cases of HAIs annually (National Report on Right Diagnosis from Health Grades, 2014). In addition, research studies have reported that the incidence of HAIs is approximately 29.13%, as out of 333 patients admit-

Corresponding Author:

Ms. Samina Yasmeen, MSN (AKU), PRN BSN, RM, RN., Assistant Nursing Instructor, College of Nursing, Holy Family Hospital Rawalpindi.
Email: Saminayasmeen71@gmail.com.

ISSN: 2231-2196 (Print)

ISSN: 0975-5241 (Online)

Received: 10.01.2022

Revised: 02.02.2022

Accepted: 01.03.2022

Published: 05.04.2022

ted during the one year in tertiary care hospitals, 97 were affected with these infections.⁴ As far as the health systems are concerned, these infections cause unnecessary morbidity and mortality,³ and along with a poor supply of health services, these infections eventually lead to extra financial burdens for the health system.⁵ Such infections annually account for approximately 99,000 deaths in the United States hospitals and estimated 37,000 deaths in Europe.⁶ Meanwhile, HCPs are also at a great risk of acquiring infections during their practices. Unsafe practices by HCPs are a major problem; and nurses are particularly more vulnerable to infections while performing their duty, due to their frequent and direct contact with patients.⁷

Worldwide, the estimated sharp needle injuries resulted in 66,000 Hep B virus (HBV) infection, 16,000 Hep C viruses (HCV) infections, and more than one thousand Human Immunodeficiency Virus (HIV) infections among HCPs; this is the very high ratio.³

The CDC and WHO suggested that standard precautions (SPs) can help to prevent the spread of HAIs, thereby ensuring the occupational safety of health-care workers. SPs are the minimum practices that apply in all cases of patients, in any setting where healthcare is delivered, regardless of the patients' diagnoses. These include regular hand washing; use of protective equipment, (PPE) like gloves, goggles, shoe cover, masks, and gowns to save oneself from the blood and body fluids of the patients; and accurate sharps' disposal to control and prevent HAIs. Adherence to the suggested infection control practices helps in decreasing the infectious agents' transmission in a hospital setting.⁸

Several studies in Pakistan have found that despite the development and availability of detailed guidelines for infection control, the rates of HAIs are still high and the practice levels to minimize the infection rates among nurses have been found to be low, especially in the public-sector hospitals of the country. The reason may be inadequate knowledge regarding SPs.^{9, 10, 11} However, these studies were not conducted exclusively on nurses and did not address all the components of SPs. The focus of this study is to evaluate all the elements of SPs with regard to nurses working in a public tertiary care hospital, where there is an obvious need for it. Therefore, this study has been conceptualized to assess the level of knowledge and practices regarding standard precautions among nurses working at a public tertiary care hospital in Islamabad, Pakistan.

MATERIAL AND METHODS

Study setting, sample size, and participant's data

This is an analytical cross-sectional study conducted at the premises of Pakistan Institute of Medical Sciences, Islamabad

(PIMS) in the period of one month from April 2017 to May 2017. The sample size was calculated using the online tool Open-Epi version 3¹² considering the prevalence of good knowledge ranged from 67%-80%^{13, 14} and for good practice it ranged between 46.1%-62%^{13, 14}, with confidence limits of 95%, and design effect of 01. The final sample size after adjusting the non-response rate (10%) was calculated in the range of 270-370. Hence, practically a sample of 320 was achieved within the specified period. The inclusion criteria for the study participants were male and female nurses with no upper age limit. Participants, should have minimum qualification, diploma in nursing with minimum six months work experience in a public tertiary hospital. Similarly, nurses working at the managerial post and provided services in the out-patient departments were excluded from the study.

Study Tool, Validity, Reliability and Pilot Testing

A structured questionnaire adopted from one of the Chinese study¹⁵, but it's modified according to the local context. The permission to use this tool has been taken from the primary author. Content validity of the tool was done by a panel of six experts, including infection control specialist doctors and nurses, clinical faculty nurses, and a statistician. The relevancy and clarity was calculated 0.70 and 0.90 respectively for Knowledge Section. Similarly, the deliberately calculated value for practice section was calculated 0.84 and 0.72 against relevancy and clarity. Moreover, the reliability of the tool was calculated by used Cronbach's alpha and it was found 0.76 and 0.84, respectively, for both knowledge and practice sections. Furthermore, a questionnaire was pre-tested on 20 nurses, in a nearby hospital that was similar to the study setting to assess its comprehension and language.

Ethical Considerations

Prior to the commencement of this study, formal ethical approval was obtained from the AKU-ERC (no. 4622-SON-ERC-17) also written permission was sought out from head of the PIMS hospital Islamabad. Since it was an interview-based study, there was no apparent harm or deception for the participants during the interview process. During data collection, privacy was maintained for all the participants, as they were interviewed in separate rooms.

Sampling Technique

The purposive sampling technique was applied for recruiting the participants. After filling the eligibility criteria duty nurses were approached in their respective departments.

Data analysis and management

In this present study, descriptive statistical analysis was used to interpret continuous variables as the mean $\pm$ standard deviation, and categorical variables as the count (percentage).

Multiple Linear Regression test was used to analyze the effect of various factors on the knowledge and practice of nurses. The data was entered twice to minimize the chances of error. For any missing data or to prevent error, data was cross-checked while entering in STATA. Each questionnaire was checked by the principal investigator before entering data for any missing value.

RESULTS

This present study was performed on a total number of 320 nurses. Here, we could try to give an overview regarding the baseline socio-demographic characteristics of nurse's such as; age, gender, marital status, professional qualification, work experience in years, work area, any training attended on standard precautions, number of training sessions attended by nurses during the last 1 year on standard precautions, and Hepatitis B vaccination status of nurses in Table 1. It indicated that the mean age of the study participants was 33.04 ± 6.65 years. More than half (66.88%) of the study participants were female, whereas 33.13% were male nurses. Amongst of these, 60.94% were married, while 39.06% were single. Respondents with Diploma holders in nursing and BSc Nurses made up the highest proportions of 59.38%. With regards to the total work experience, the majority (66.56%) of the participants had experience of 1-10 years, 27.81% of 11-20 years, and only 5.63% had working experience of 21-30 years.

Among nurses, the majority (28.44%) were working in the ICU/CCU, Burn and Hemodialysis units. Concerning the trainings attended during the last one year, more than half (77.19%) had never attended any training session, while 18.13% and 2.81% had attended one and two sessions, respectively. Only a few (1.88%) reported that they had attended 3-5 training sessions on SPs during the last one year.

Regarding the refresher courses attended during the last one year, it was reported that around two thirds (74.69%) had never attended any refresher course, while 18.44% and 5.31% had participated in one and two courses, respectively, whereas 3-5 number of courses had been attended by only 1.56% of the nurses. Furthermore, the majority (91.88%) of the participants reported a need for continued trainings regarding SPs. Around 91.56% stated that they had SPs' items available in their units, while 92.81% reported that they had easy access to a hand washing area in their departments. Moreover, 19.69% nurses had not been vaccinated against hepatitis B.

Table 1: Socio-Demographic

Socio-Demographic Characteristics	Frequency (%)
Age* (in years)	33.04 $\pm$ 6.65
Gender	
Female	214 (66.88%)
Male	106 (33.13%)
Marital Status	
Married	195 (60.94%)
Un-married	125 (39.06%)
Professional Qualification	
Diploma in Nursing	190 (59.38%)
BScN	125 (39.06%)
MScN	05 (1.56%)
Work Experience in Years	
1-10 years	213 (66.56%)
11-20 years	89 (27.81%)
21-30 years	18 (5.63%)
Work area of Nurses	
ICU/CCU, Burn & Hemodialysis	91 (28.44%)
Medicine, Emergency & Neuro	89 (27.81%)
Gynae&Peads	58 (18.13%)
Surgery & Operating Room	58 (18.13%)
Private Block & Isolation Unit	24 (7.50%)
Any Training attended on Standard Precautions	
Yes	160 (50%)
No	160 (50%)
Number of Training Sessions attended by Nurses during the last 1 year on Standard Precautions	247 (77.19%)
No training session	58 (18.13%)
1 session	9 (2.81%)
2 sessions	6 (1.88%)
3-5 sessions	
Any Refresher Courses attended on Standard Precautions	
Yes	122 (38.13%)
No	198 (61.88%)
Number of Refresher Courses attended by Nurses during the last 1 year on Standard Precautions	239 (74.69%)
No courses	59 (18.44%)
1 course	17 (5.31%)
2 courses	5 (1.56%)
3-5 courses	
Is there a Need for Training on Standard Precautions?	
Yes	294 (91.88%)
No	26 (8.13%)
Availability of Standard Precautions items in Unit	
Yes	293 (91.56%)
No	27 (8.44%)
Easy access to Hand Washing area in Unit	297 (92.81%)
Yes	23 (7.19%)
No	
Hepatitis B Vaccination status of nurses	
Yes	257 (80.31%)
No	63 (19.69%)

The mean knowledge score of the participants regarding SPs, was 19.6 ± 3.31 , while the mean practice score was 13.00 ± 5.23 . (Table 2).

Table 2: Mean Scores of Knowledge and Practice of Nurses regarding Standard Precautions

Mean Scores of Knowledge and Practice	Mean $\pm$ SD
Nurses' mean score of Knowledge of standard precautions	19.6 ± 3.31
Nurses' mean score of Practices of standard precautions	13.00 ± 5.23

For knowledge, simple linear regression showed that increasing age, female in gender, being married, having a diploma

and BScN level of education, having experience of working areas like surgery, operating room, private block and isolation unit, receiving no training on SPs during the last one year, and attending any refresher course during last one year were negatively associated with the level of knowledge regarding SPs. However, attending trainings and refresher courses on SPs, and having attended more than two refresher courses during the last one year, expressing need for continuous training sessions, having access to hand washing areas, along with the availability of SPs' items, and receiving Hep. B vaccination indicated a positive relationship with the level of knowledge in nurses. The detailed factors associated with practice of standard precautions among nurses are presented in Table 3.

Table 3: Factors associated with Knowledge of Standard Precautions among Nurses Working at the Pakistan Institute of Medical Sciences, Islamabad (Univariate analysis)

Factors	Unadjusted β -Coefficient (SE)	95% CI	P-Value ($\alpha \leq 0.25$)	R ²
Age (in years)	-0.01(0.02)	-0.07, 0.03	0.57	0.00
Gender				
Male (Ref)	-0.79 (0.39)	-1.56, -0.02	0.04	0.01
Female				
Marital Status				
Un-married (Ref)	-0.33 (0.38)	-1.08, 0.41	0.37	0.00
Married				
Professional Qualification				
MScN (Ref)	-1.64 (1.50)	-4.60, 1.31	0.27	0.00
Diploma in Nursing	-1.4 (1.51)	-4.37, 1.57	0.35	0.00
BScN				
Work Experience in Years				
1-10 years (Ref)	-0.38 (0.41)	-1.21, 0.43	0.35	0.00
11-20 years	-0.77(0.81)	-2.37, 0.83	0.34	0.00
21-30 years				
Work area of Nurses				
Medicine, Emergency & Neuro (Ref)	0.06 (0.49)	-0.90, 1.03	0.89	0.02
ICU/CCU, Burn & Hemodialysis	1.11(0.55)	0.01, 2.21	0.04	0.02
Gynae&Paeds	-0.36 (0.55)	-1.46, 0.72	0.51	0.02
Surgery & Operating Room	-0.24 (0.75)	-1.74, 1.24	0.74	0.02
Private Block & Isolation Unit				
Any Training attended on Standard Precautions				
Yes	0.86 (0.36)	0.13, 1.58	0.02	0.01
No (Ref)				
Number of Training Sessions attended by Nurses during the last 1 year on Standard Precautions				
1 session (Ref)	-1.04 (0.48)	-1.98, -0.09	0.03	0.02
No training session	0.86 (1.18)	-1.45, 3.19	0.46	0.02
2 sessions	-0.63 (1.41)	-3.41, 2.14	0.65	0.02
3-5 sessions				

Table 3: (Continued)

Factors	Unadjusted β -Coefficient (SE)	95% CI	P-Value ($\alpha \leq 0.25$)	R ²
Any Refresher Courses attended on Standard Precautions	1.10 (0.37)	0.36, 1.85	<0.01	0.02
Yes				
No (Ref)				
Number of Refresher Courses attended by Nurses during the last 1 year on Standard Precautions				
1 course (Ref)	-0.93(0.47)	-1.87, 0.00	0.05	0.03
No courses	0.81(0.90)	-0.96, 2.59	0.36	0.03
2 courses	1.69 (1.52)	-1.31, 4.70	0.26	0.03
3-5 courses				
Is there a Need for Training session on Standard Precautions?	2.45 (0.66)	1.14, 3.76	<0.01	0.04
Yes				
No (Ref)				
Availability of Standard Precautions items in Unit	1.74 (0.66)	0.44, 3.04	<0.01	0.02
Yes				
No (Ref)				
Easy access to Hand washing area in Unit				
Yes	1.99 (0.71)	0.59, 3.39	<0.01	0.02
No (Ref)				
Hepatitis B Vaccination status of nurses				
Yes	2.42 (0.44)	1.54, 3.30	<0.01	0.08
No (Ref)				

For the final multiple linear regression model, the knowledge regarding SPs decreased in the female gender by -0.96 (95% C.I; -1.71, -.22), as compared to the male nurses. A better level of knowledge was seen among nurses working in the Pediatric and Gynecology departments by 1.30 (95% C.I; 0.26, 2.33). The need for continued training sessions on

SPs revealed a significant 0.66 (95% C.I; 1.07, 3.67) relationship with the knowledge score. A positive relation of 2.37 (95% C.I; 1.50, 3.23) was seen on the knowledge score of nurses who received Hep. B vaccine (Table 4). The final model portrays 15.6% (Adjusted $r^2=0.156$) variability regarding knowledge.

Table 4: Factors associated with Knowledge regarding Standard Precautions among Nurses Working at the Pakistan Institute of Medical Sciences, Islamabad (Final Model)

Factors	Adjusted β -Coefficient (SE)	CI 95%	P-value <0.05
Gender			
Male (Ref)	-0.96 (0.37)	-1.71, -.22	<0.01
Female			
Work area of Nurses			
Medicine, Emergency & Neuro (Ref)	0.21(0.45)	-0.69, 1.11	0.64
ICU/CCU, Burn & Hemodialysis	1.30 (0.52)	0.26, 2.33	<0.01
Gynae & Peads	0.09 (0.53)	-0.95, 1.14	0.86
Surgery & Operating Room	0.50 (0.71)	-0.90, 1.90	0.48
Private Block & Isolation Unit			
Is there a Need for Training Session on Standard Precautions?			
Yes	2.37 (0.66)	1.07, 3.67	<0.01
No (Ref)			
Hepatitis B Vaccination status of nurses			
Yes	2.37 (0.43)	1.50, 3.23	<0.01
No (Ref)			

P-value of the overall model <0.01

Adjusted R-squared = 0.156

As for practice, the final model showed that it increased by 2.24 (95% C.I; 0.53, 3.96) among participants who attended training sessions on SPs. Practices of nurses were positively related to increase in the availability of SPs items and accessibility to a hand washing area in the departments by 2.09 (95% C.I; -0.01, 4.21) and 2.45 (95% C.I; 0.25, 4.66), re-

spectively. The Hep. B vaccinated nurses showed a positive impact of 1.49 (95% C.I; 0.07, 2.91) on the level of practices as compared to non-vaccinated nurses against Hep B (Table 5). The final model depicts 0.068 % (Adjusted $r^2=6.8$) variability in practice.

Table 5: Factors associated with Practice regarding Standard Precautions among Nurses Working at the Pakistan Institute of Medical Sciences, Islamabad (Final Model)

Factors	Adjusted β -Coefficient (SE)	95% CI	P-value <0.05
Any Training attended on Standard Precautions			
Yes	2.24 (0.87)	0.53, 3.96	<0.01
No (Ref)			
Availability of Standard Precautions items in Unit			
Yes	2.09 (1.07)	-0.01, 4.21	0.05
No (Ref)			
Easy access to Hand Washing area			
Yes	2.45 (1.12)	0.25, 4.66	0.02
No (Ref)			
Hepatitis B Vaccination status of nurses			
Yes	1.49 (0.72)	0.07, 2.91	0.03
No (Ref)			

DISCUSSION

The current study highlights the level of knowledge and practices regarding SPs among nurses working in a public-sector hospital in Islamabad, Pakistan. The findings of the current study were consistent with other national and international studies, showing that nurse's knowledge and practices regarding SPs is one of the major challenge due to number of reasons.

In present study, the mean age of the study participants was 33.04 ± 6.65 years which is consistent with the findings reported in the previously published studies in neighboring countries, like Afghanistan, and in Vietnam.^{14, 16} The study findings can be easily compared with the existing literature from Afghanistan and Vietnam as the descriptive results, especially age, are quite similar. Present study also observed that more than half of the participants working as bedside nurses were diploma holders in nursing. This reflects the fact that the majority of the nursing personnel have basic qualification in nursing, which can impact the practices of SPs.^{17, 18} This finding can be explained in the Pakistani context by the fact that the nurses who get higher qualification and more experience prefer to teach rather than work in clinical settings. Hence, this can be another reason why nurses have lower knowledge and poor practices regarding SPs, as in the diploma curriculum, proper attention is not given to teaching the infection control protocols. However, this study did not find any meaningful differences in the knowledge and practice of all nurses regarding SPs, regardless of the work experience

and professional qualification. It was assumed that, therefore, lack of ongoing trainings/ educational programs in the public healthcare facilities in Pakistan, including trainings on SPs, might have resulted in these findings, and that years of experience also did not influence the knowledge scores. Similarly, for professional qualification, it was assumed that insufficient focus on infection control measures, including SPs, during the diploma program could have resulted in showing no significant difference between knowledge and qualification; and between practice and professional qualification. These findings were in concordance with the existing study in Afghanistan and others.^{16, 19} However, the findings of the current study were different from a study that has reported a significant relation of knowledge with years of experience and professional qualification. That study showed a higher ratio for the younger population, where the majority of the participants had higher qualification, e.g., bachelor's degree in nursing.²⁰

Knowledge and Practices Regarding Standard Precautions

The study findings that female nurses were less likely to have adequate knowledge with increasing with age was quite similar with one of the international study,¹⁶ but in contrary with the study results in Nigeria.²¹, which reported that females had better knowledge of SPs as compared to the male health professionals. Moreover, in the current study, the significant association between the need for trainings sessions on SPs and the knowledge score well explains the phenomena of

lack of trainings and workshops on infection control in public sector health facilities; a similar finding has been reported in the literature.¹⁵ However, in literature, great emphasis can be seen with regard to the improvement in knowledge and practices through inclusion of SPs in medical education/ trainings for all HCWs.¹⁴ The findings of the present study demonstrate a relatively better knowledge among nurses in the Gynecology and Pediatric department in comparison with the rest of the working area. However, the current findings were opposite to an interventional study in a pediatric unit in Egypt, which showed deficient knowledge prior to intervention as compared to the post intervention stage. In this study, the nurses who were vaccinated for Hep B had good knowledge of SPs as compared to those who were not vaccinated. The same finding is reported by a similar study in Afghanistan (16), but is contradictory to the findings reported in two studies reported in Nigeria.^{17, 22} Concerning the practices of SPs, the current study also demonstrated a relatively lower level of practices among nurses and this was similar to the findings reported in literature in Afghanistan, Vietnam, and others.^{14, 16, 23} The study in China “Factors impacting compliance with SPs in nursing”, supported the current study finding that the nurses who had received trainings in the last one year showed good practices as compared to those who had not attended any training sessions ever, as they also reported that the nurses who had received trainings had better compliance in comparison to the nurses who had never attended any training session.^[15] Other studies from Cypriot and Ethiopia also have similar findings.^{15, 24, 25} As far as the availability of SPs items, including accessibility to a hand washing area is concerned, the present study significantly revealed that practices were better in those areas where sufficient resources were provided and nurses had easy access to a hand washing area in their units. The findings are in concordance with previously published literature.^{15, 16, 21} Additionally, the findings of the study, that nurses vaccinated against Hep B showed better practices in contrast to those who were not vaccinated are contradictory to a study done in North-eastern Nigeria about “Knowledge of Hep B vaccination among operation room staffs and their status”²² and the difference in the findings can be due to that the operating room nurses are even not allowed to enter in the work area without precautions.

CONCLUSION

Based on the current study findings, it can be inferred that the nurses in public hospital have relatively inadequate knowledge and practices regarding standard precautions were towards lower side. These findings suggest that continuous education sessions, seminars, refresher courses, and workshops should be made mandatory for all health professionals in hospitals, particularly nurses, to encourage them to improve their practices based on improved knowledge.

ACKNOWLEDGEMENT

Exclusive thanks to the Aga Khan university School of Nursing. My sincere gratitude towards thesis supervisor and committee members for their timely, constructive, and critical feedback at each step of the entire journey. I am thankful to the members of this article to help in manuscript writing, reviewing till to the publication.

SOURCE OF FUNDING:

None. Since, it a Master’s thesis as core step in successful graduation, so no any additional funding source remained its part including any public, private or NGO, s.

CONFLICT OF INTEREST:

There is no any conflict of interest among members.

AUTHORS’ CONTRIBUTION:

SY, conceived idea of the research, designed & editing of manuscript

TSA, WK, & ZK did designed and statistical analysis

SMH & SB did manuscript writing, critical review and final approval of manuscript

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