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A study on awareness and practice regarding standard precautions of infection control and bio-medical waste management among nursing staffs of BGS global institute of medical sciences and hospital, Bengaluru

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Abstract
Introduction: Standard precautions are meant to reduce the risk of transmission of blood-borne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control precautions, which are to be used, as a minimum, in the care of all patients. This study aims at assessing the knowledge and practice of nursing staff about Standard Precautions.
Objectives: To assess the level of awareness and practice of standard precautions for infection control among nursing staff.
To find association between knowledge and practice of nursing staff regarding standard precautions and selected base line variables.
Methodology: A cross sectional study was conducted at BGS GIMS by universal sampling method during the month of October 2018. A self-administered questionnaire consisting of 3 sections, socio-demographic data, knowledge and practice was given to each of the participants. A total of 45 questions were included.
Results: The study was conducted on 104 nursing staff working at BGSGIMS Hospital.In the study population it was found that only 20% had good knowledge on standard precautions. And only 33% of the study population had good level of practice of standard precautions. Among the study population who had received training regarding standard precautions, only 27.3% had good knowledge on standard precautions.
Conclusion: This study highlights inadequate knowledge about awareness and practice of standard precautions and about the spread of hospital acquired infections. Training in standard precautions to be imparted in all categories of staff in the hospital.

Keywords: Standard precautions, infection control, biomedical waste management, nursing staffs

1. Introduction
The term 'Universal Health precautions' was introduced in 1985 by Garner. He defined it as "The prevention of transmission of blood borne pathogens like HIV through strict respect by health workers of rules concerning care and nursing [1]. Gerber ding *et al* also defined Universal health precautions as The routine use of appropriate barrier and technique to reduce the likelihood of exposure to blood, other body fluids and tissues that may contain blood borne pathogens [1]. Centre for Disease Control (CDC), Atlanta, in 1987 defined Universal health precautions and recommended that blood and body fluids precautions be consistently used for all the patients[2]. Although universal health precautions, have been in existence for a long period of time and the risk of transmission of blood borne infections to health care workers is very real, the awareness levels among health care workers to those precautions is still far from satisfactory. Standard precautions are meant to reduce the risk of transmission of blood-borne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control precautions, which are to be used, as a minimum, in the care of all patients [3]. It is essential for all nurses to follow universal precautions during their clinical posting, as, any percutaneous or per mucosal exposure to blood or body fluids, represent a potential HIV infection. These includes skin–piercing procedures with contaminated objects and even

broken skin, open wounds, cuts and mucosal membranes (mouth or eyes) to the blood and body fluids of an infected person.

Although they account for a minority of HIV infections, health care procedures represent preventable source of HIV infection, injections are of particular concern, accounting for an estimated 3.9% to 7.0% of new cases worldwide. In addition, unsafe practices in haemodialysis and plasmapheresis centers are associated with HIV transmission. Health care worker protection is an essential component of any strategy to prevent disease against HIV infected patients by health care workers. If health care workers feel they can protect themselves from HIV infection, they can provide better care[4.] An assessment of knowledge and practice of standard precautions among health care workers is a prerequisite for initiating and implementing a successful infection prevention and control strategy in any health facility [5].

These potentially fatal infections have no cure and no vaccine (except hep B) and the cornerstone of prevention in healthcare settings is the simple practice of Universal Health Precautions. Universal health precautions assume that anybody in hospitals, especially patients, is a potentially a carrier of blood borne pathogens, therefore all patients are treated in the same way as though they are infected [4]. In practical terms, it involves the use of gloves, aprons, goggles, suitable care of needles, sharps and other contaminated instruments, house keeping with appropriate cleaning policies and ensuring strict adherence to standard practices [3]. This requires the sustained precision of protective materials, proper training of health care providers and adherence to sterilization and disinfection protocols.

WHO document on practical guidelines for infection control 2004 states - Treating all patients in the health care facility with the same basic level of standard precautions involves work practices that are essential to provide a high level of protection to patients, health care workers and visitors [7].

Guidelines on airborne infection control provide technical and operational guidance to reduce the risk of transmission of airborne pathogens. They also prioritize and give details about how to manage activities at national, state and local/ health care facility levels. Standard Precautions are applicable to all patients in all health care settings. They combine the Universal precautions, body substance isolation and airborne precautions [8].

A review article ― "Back to basics of infection control on hand hygiene "says that most of the healthcare associated infections are preventable. To tackle these microbes, human beings will have to follow basic and simple protocols of infection prevention. Hence, hand washing should become an educational priority [9].

A cross-sectional survey was undertaken among 266 health care workers in rural north India. Awareness and understanding of Universal precautions were partial, and UP compliance was suboptimal. Being in the job for a long period increased compliance [10].

Jayanth and team reviewed 1- year ongoing surveillance of Needle Stick Injuries (NSIs) in Christian Medical College (CMC) Vellore. The devices responsible for NSI was mainly hollow bore needles. Recapping of needles caused 25(8.5%) and other improper disposal of the sharps resulted in 55 (18.6%) of the needle stick injury (NSI) [11].

A cross sectional survey was conducted in a 293 bedded tertiary care cardiac hospital in revealed a few gaps in the awareness amongst HCWs about NSSIs like risks associated with needle-stick injuries and use of preventive measures, disassembling of needles prior to disposal [12].

An Article on health of health care professionals said that health care professionals were most negligent [3]. The risk of hepatitis B infection is well documented among healthcare workers. The incidence of HBV infection had decreased with the use of Hepatitis B vaccine [14].

A two-year continuing surveillance study was done among 255 health care workers (HCWs)showed that during suturing and while dealing with restless patients and the conclusion was so far there was no case of sero conversion as a result of NSIs in their center [15].

In a cross-sectional survey on Nurses and other health care workers from all wards of Lok Nayak Hospital recommended that NSI prevention is an integral part of prevention programs in the work place and training of health care workers should be an ongoing activity [17].

A study was done in Kerala State Health Services Personnel in Neyyathinkara Taluk. The findings of the study show B vaccination was taken by 68.6 percent of respondents only [22].

From the literature review, we understood that awareness was the base and this alone would not help but practice of standard Precautions is the one that can reduce the load of Health Care Associated Infections. Standard precautionary measures are a set of infection control practices used to prevent infection from the health personnel to the patient and vice versa. It is such a vital issue that has to be strictly followed. The present study focuses to study the level of awareness and practice of these precautionary measures among nursing staff at BGS GIMS, Bangalore.

2. Objectives

1. To assess the level of awareness and practice of standard precautions for infections control among nursing staff.
2. To find association between knowledge and practice of nursing staff regarding universal health precautions and selected base line variables (age and years of experience).

3. Methodology

3.1. Study subjects: All nursing staff of BGS Global Institute of Medical Sciences, Bengaluru

3.2. Inclusion criteria

1. All those who are available on the days of the study
2. All those who are willing to participate in the study

3.3. Exclusion criteria

1. Nurses working in operation theatre because the training received by them will be different.

3.4. Study design: A Cross sectional study.

3.5. Sample size

The sample comprised of all the nurses working in BGS GIMS & Hospital, Bangalore

3.6. Method of statistical analysis

Data processing was performed using Microsoft Excel 2010. Data analysis was done using SPSS version 17. Descriptive statistics and univariate analysis was performed for knowledge and practice questions. Bivariate analysis using cross tabulation and Chi-square test was performed to

identify any association between dependent and independent variables. p-value of less than 0.05 was considered as statistically significant.

3.7. Methodology

The data collection process involves the precise, systematic gathering of information relevant to the topic of discussion. Data collection process was started by seeking the permission of Principal, Medical superintendent, Nursing superintendent. After obtaining a written informed consent, a structured pretested questionnaire was used to collect data. Subjects were briefed about the objectives of study and questionnaire was given. They were observed throughout the time questionnaire was filled. Doubts clarified. Data collection process was terminated after thanking the subjects for their participation and co-operation.

4. Results

The total number of nursing staff in BGS GIMS & H, Bangalore was 195 and the study was conducted on 104 among them. The outcomes of data analyzed based on the objectives of the study are described here. After scrutinizing the data entered, they were analyzed using the software, SPSS for windows version 21. The data were analyzed for identifying the basic characteristics of the study population and the association between several independent variables and the outcome variables – awareness and practice of standard precautions. The outputs of analysis are organized under the following headings which are characteristics of the study population and the distribution of outcome variables in the study population analyzed by univariate analysis and bivariate analysis.

Table 1: Age distribution in the study population

Age Group	No. of Nursing Staff	Percent
20 – 25	69	66.3
25 – 30	31	29.8
30 – 35	3	2.9
35 – 40	1	1.0
Total	**104**	**100.0**
66.3% of the population was in the age group of 20 to 25 years. And Median age of 24 years with SD of 2.3 years		

Descriptive Statistics	Min	Max	Mean	Median	Std. Deviation
Age in Years	20	35	23.9	24	2.3

Table 2: Gender Distribution in the study population

Gender	No. of Nursing Staff	Percent
Male	8	7.7
Female	96	92.3
Total	104	100.0

92.3% of the study population was females

Table 3: Distribution of study population based on qualification

Qualification	No. of Nursing Staff	Percent
GNM	96	92.3
B.Sc.	5	4.8
M.Sc.	3	2.9
Total	104	100.0

Among the study population, the qualification of 92.3% was GNM.

Table 4: Distribution of study population based on place of work

Place of Duty	No. of Nursing Staff	Percent
Cas	6	5.8
Derma-OPD	3	2.9
Ent OPD	3	2.9
FMW	15	14.4
FSW	3	2.9
ICU	7	6.7
Med OPD	3	2.9
MMW	17	16.3
MSW	3	2.9
OPHTHAL-OPD	4	3.8
Ortho OPD	12	11.5
P-ICU	3	2.9
Peds-OPD	1	1.0
Psychiatry 1	1	1.0
Post-Op	6	5.8
Ortho-FW	3	2.9
Ortho-Mw	7	6.7
Surgery OPD	6	5.8
Tb Chest	1	1.0
Total	104	100.0

16.3 % of the study population worked in MMW.

CAS: Casualty; derma: Dermatology; ENT: Ear, Nose, Throat; FMW: Female medicine ward; FSW: Female surgery ward; ICU: Intensive Care Unit; Med: Medicine;

MMW: Male medicine ward; MSW: Male surgery ward; Ophthal: Ophthalmology;

ORTHO: Orthopaedics; P-ICU: Paediatric intensive care unit; PEDS: Paediatrics; Post-OP: Post-operative ward; Ortho-FW: Orthopaedics female ward;

Ortho-MW: Orthopaedics male ward.Nurses working in casualty, ICU, P-ICU were also considered as staffs working in the ward (IP).

Table 5: Distribution of the study population based on work experience

Work Experience (Years)	No. of Nursing Staff	Percent
1	32	30.8
2	29	27.9
3	30	28.8
4	9	8.7
5	1	1.0
6	1	1.0
8	1	1.0
9	1	1.0
Total	104	100.0

30.8% of the study population had only 1 year of experience.

Table 6: Distribution of study population based on work experience

Work Experience (Years)	No. of Nursing Staff	Percent
≤ 2	61	58.7
> 2	43	41.3
Total	104	100.0

Only 41.3% of the study population had >2 years of experience.

Table 7: Distribution of the study population based on training received regarding standard precautions

Training Received	No. of Nursing Staff	Percent
Yes	82	78.8
No	22	21.2
Total	104	100.0

Among the study population, 78.8% have received training regarding standard precautions.

Table 8: Hepatitis-B vaccine coverage in the study population

Hepatitis-B Doses Received	No. of Nursing Staff	Percent
Not Received	29	27.9
One Dose	6	5.8
Two Doses	19	18.3
Three Doses	50	48.1
Total	104	100.0
Hepatitis vaccine coverage with three doses of the vaccine was only 48.1% in the study population.		

Table 9: Association between Knowledge and Practice of the study population

Knowledge	Pearson's Correlation co-efficient 'r'	p-value
Practice	+ 0.486	< 0.05

'r' lies between 0 to +1, hence it is a positive correlation.
The calculated correlation co-efficient 'r' lies between 0 to +0.5 hence there is a weak correlation.

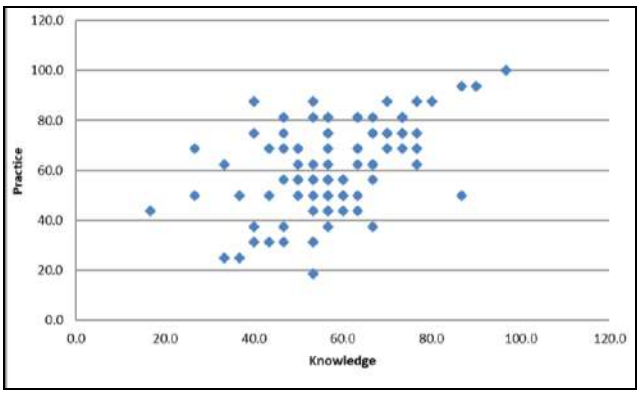

Fig 1: Therefore, if knowledge increases, there is a corresponding increase in the practice.

Table 10: Distribution of the study population based on knowledge regarding standard precautions

Knowledge	No. of Nursing Staff	%
Poor (<40%)	7	6.74
Average (40-70%)	76	73.06
Good (>70%)	21	20.20
Total	104	100.0

Among the study population, only 20% had good knowledge regarding standard precautions.

Table 11: Distribution of the study population based on the level of practice of standard precautions

Practice	No. of Nursing Staff	%
Poor (<40%)	12	11.5
Average (40-70%)	58	55.8
Good (>70%)	34	32.7
Total	104	100.0

Among the study population, 55.8% had average level of practice of standard precautions.

Table 12: Association between work experience and knowledge of the study population

Work Experience in Years		Knowledge				Yates' chi-square	p-value
		Good	Average	Poor	Total		
≤ 2	N	8.00	49.00	4.00	61	3.788	0.150
	%	13.11	80.33	6.56	100.0		
>2	N	13.00	27.00	3.00	43		
	%	30.23	62.79	6.98	100.0		
Total	N	21.00	7.00	7.00	104		
	%	20.19	7.00	6.73	100.0		

It was found that there was no significant association between work experience and knowledge of the study population

Table 13: Association between work experience and practice of the study population

Work Experience in Years		Practice				Yates' Chi-square	p-value
		Good	Average	Poor	Total		
≤ 2	N	15.00	36.00	10.00	61	4.631	0.098
	%	24.59	59.02	16.39	100.0		
>2	N	19.00	22.00	2.00	43		
	%	44.19	51.16	4.65	100.0		
Total	N	34.00	58.00	12.00	104		
	%	32.70	55.80	11.50	100.0		

It was found that there was no significant association between work experience and practice of the study population.

Table 14: Association between place of work and knowledge of the study population

Place of Work		Knowledge				Yates' Chi-square	p-value
		Good	Average	Poor	Total		
IPD	N	14.00	48.00	2.00	64	2.069	0.355
	%	21.88	75.00	3.13	100.0		
OPD	N	7.00	28.00	5.00	40		
	%	17.50	70.00	12.50	100.0		
Total	N	21.00	76.00	7.00	104		
	%	20.20	73.10	6.70	100.0		

It was found that there was no significant association between place of work and knowledge of the study population

Table 15: Association between Place of work and level of Practice of the study population

Place of Work		Practice				Chi-square	p-value
		Good	Average	Poor	Total		
IPD	N	23.00	36.00	5.00	64	2.545	0.280
	%	35.94	56.25	7.81	100.0		
OPD	N	11.00	22.00	7.00	40		
	%	27.50	55.00	17.50	100.0		
Total	N	34.00	58.00	12.00	104		
	%	32.70	55.80	11.50	100.0		

It was found that there was no significant association between place of work and practice of the study population.

Table 16: Association between Training received and Knowledge

Training Received		Knowledge			
		Good	Average	Poor	Total
Yes	N	3.00	8.00	0.00	11
	%	27.27	72.73	0.00	100.0
No	N	18.00	68.00	7.00	93
	%	19.35	73.12	7.53	100.0
Total	N	21.00	76.00	7.00	104
	%	20.20	73.10	6.70	100.0

Table 17: Association between Training received and Practice

Training Received		Practice			
		Good	Average	Poor	Total
Yes	N	4.00	7.00	0.00	11
	%	36.36	63.64	0.00	100
No	N	30.00	51.00	12.00	93
	%	32.26	54.84	12.90	100
Total	N	34.00	58.00	12.00	104
	%	32.70	55.80	11.50	100

Table 18: Bivariate analysis regarding knowledge of the study population on hand hygiene

		Knowledge on Hand hygiene									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	2	18.2	5	45.5	4	36.4	11	100.0	0.285*	0.867*
	No	15	16.1	32	34.4	46	49.5	93	100.0		
Experience	≤2	7	11.5	20	32.8	34	55.7	61	100.0	4.265	0.118
	>2	10	23.3	17	39.5	16	37.2	43	100.0		
Place of work	IPD	10	15.6	23	35.9	31	48.4	64	100.0	0.064	0.968
	OPD	7	17.5	14	35.0	19	47.5	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 18.2% had good knowledge and 36.4% had poor knowledge regarding hand hygiene.

Among the study population with experience >2 years, only 23.3% had good knowledge and 37.2% had poor knowledge regarding hand hygiene.

Among the study population who worked in the wards, only 15.6% had good knowledge and 48.4% had poor knowledge regarding hand hygiene.

Table 19: Bivariate analysis regarding knowledge of the study population on safe injection practices

		Knowledge on safe injection practices									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	3	27.3	3	27.3	5	46	11	100.0	0.488*	0.783
	No	23	24.7	40	43	30	32	93	100.0		
Experience	≤2	9	14.8	27	44.3	25	41	61	100.0	8.854	0.011
	>2	17	39.5	16	37.2	10	23	43	100.0		
Place of work	IPD	17	26.6	28	43.8	19	30	64	100.0	1.173	0.556
	OPD	9	22.5	15	37.5	16	40	40	100.0		

*Yates corrected

Among the study population who had received training regarding standard precautions, only 27.3% had good knowledge and 45.5% had poor knowledge on safe injection practices.

Among the study population with experience >2 years, only 39.5% had good knowledge and 23.3% had poor knowledge on safe injection practices.

Among the study population who worked in the wards, 26.6% had good knowledge and 29.7% had poor knowledge on safe injection practices.

Table 20: Bivariate analysis regarding knowledge of the study population on personal protective equipment

		Knowledge on personal protective equipment									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	3	27.3	4	36.4	4	36	11	100.0	0.064 *	0.968
	No	30	32.3	29	31.2	34	37	93	100.0		
Experience	≤2	15	24.6	22	36.1	24	39	61	100.0	3.562	0.168
	>2	18	41.9	11	25.6	14	33	43	100.0		
Place of work	IPD	22	34.4	18	28.1	24	38	64	100.0	1.091	0.579
	OPD	11	27.5	15	37.5	14	35	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 27.3% had good knowledge and 36.4% had poor knowledge on personal protective equipment. Among the study population with experience >2 years, only 41.9% had good knowledge and 32.6% had poor knowledge on personal protective equipment. Among the study population who worked in the wards, only 34.4% had good knowledge and 37.5% had poor knowledge on personal protective equipment

Table 21: Bivariate analysis regarding knowledge of the study population on infection control

		Knowledge on Infection control									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	1	9.1	8	72.7	2	18.2	11	100.0	0.127*	0.938
	No	11	11.8	64	68.8	18	19.4	93	100.0		
Experience	≤2	4	6.6	43	70.5	14	23.0	61	100.0	2.864	0.238
	>2	8	18.6	29	67.4	6	14.0	43	100.0		
Place of work	IPD	10	15.6	46	71.9	8	12.5	64	100.0	4.722*	0.094
	OPD	2	5.0	26	65.0	12	30.0	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 9.1% had good knowledge and 18.2% had poor knowledge on infection control. Among the study population with experience >2 years, only 18.6% had good knowledge and 14.0% had poor knowledge on infection control. Among the study population who worked in the wards, only 15.6% had good knowledge and 12.5% had poor knowledge on infection control

Table 22: Bivariate analysis regarding knowledge of the study population on Biomedical waste management

		Knowledge on Biomedical waste management									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	9	81.8	2	18.2	0	0.0	11	100.0	-	-
	No	35	37.6	43	46.2	15	16.1	93	100.0		
Experience	≤2	28	45.9	27	44.3	6	9.8	61	100.0	2.636	0.267
	>2	16	37.2	18	41.9	9	20.9	43	100.0		
Place of work	IPD	30	46.9	27	42.2	7	10.9	64	100.0	2.267	0.321
	OPD	14	35.0	18	45.0	8	20.0	40	100.0		

Among the study population who had received training regarding standard precautions, 81.8% had good knowledge and 18.2% had average knowledge on Biomedical waste management. Among the study population with experience >2 years, only 37.2% had good knowledge and 20.9% had poor knowledge on Biomedical waste management. Among the study population who worked in the wards, only 46.9% had good knowledge and 10.9% had poor knowledge on Biomedical waste management.

Table 23: Bivariate analysis regarding knowledge of the study population on Post exposure prophylaxis

		Knowledge on Post exposure prophylaxis							
		Good		Average		Poor		Total	
		N	%	N	%	N	%	N	%
Training received	Yes	0	0.0	2	18.2	9	81.8	11	100.0
	No	1	1.1	27	29.0	65	69.9	93	100.0
Experience	≤2	0	0.0	12	19.7	49	80.3	61	100.0
	>2	1	2.3	17	39.5	25	58.1	43	100.0
Place of work	IPD	1	1.6	17	26.6	46	71.9	64	100.0
	OPD	0	0.0	12	30.0	28	70.0	40	100.0

Among the study population who had received training regarding standard precautions, 0.0% had good knowledge and 81.8% had poor knowledge on Post exposure prophylaxis. Among the study population with experience >2 years, only 2.3% had good knowledge and 58.1% had poor knowledge on Post exposure prophylaxis. Among the study population who worked in the OPDs, 0.0% had good knowledge and 70% had poor knowledge on Post exposure prophylaxis.

Table 24: Bivariate analysis regarding Practice of Hand Hygiene among the study population

		Practice of Hand hygiene									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	7	63.6	4	36.4	0	0.0	11	100.0	-	-
	No	51	54.8	34	36.6	8	8.6	93	100.0		
Experience	≤2	26	42.6	29	47.5	6	9.8	61	100.0	8.543*	0.013*
	>2	32	74.4	9	20.9	2	4.7	43	100.0		
Place of work	IPD	37	57.8	25	39.1	2	3.1	64	100.0	3.287 *	0.193*
	OPD	21	52.5	13	32.5	6	15.0	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, 63.6% had good practice and 0.0% had poor practice of hand hygiene. Among the study population with experience >2 years, only 74.4% had good practice and 4.7% had poor practice of hand hygiene. Among the study population who worked in the wards, 57.8% had good practice and 3.1% had poor practice of hand hygiene.

Table 25: Bivariate analysis regarding Practice of Safe Injection among the study population

		Practice of safe injection practices									
		Good		Average		Poor		Total		Chi-square	p-value
		N	%	N	%	N	%	N	%		
Training received	Yes	1	9.1	4	36.4	6	54.5	11	100.0	3.242*	0.197*
	No	30	32.3	40	43.0	23	24.7	93	100.0		
Experience	≤2	20	32.8	24	39.3	17	27.9	61	100.0	0.746	0.688
	>2	11	25.6	20	46.5	12	27.9	43	100.0		
Place of work	IPD	23	35.9	26	40.6	15	23.4	64	100.0	3.389	0.183
	OPD	8	20.0	18	45.0	14	35.0	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 9.1% had good practice and 54.5% had poor safe injection practices. Among the study population with experience >2 years, only 25.6% had good practice and 27.9% had poor safe injection practices. Among the study population who worked in the wards, only 35.9% had good practice and 23.4% had poor safe injection practices.

Table 26: Bivariate analysis regarding Practice of personal protective equipment among the study population

		Practice of personal protective equipment								Chi-square	p-value
		Good		Average		Poor		Total			
		N	%	N	%	N	%	N	%		
Training received	Yes	3	27.3	7	63.6	1	9.1	11	100.0	0.864*	0.649*
	No	23	24.7	45	48.4	25	26.9	93	100.0		
Experience	≤2	10	16.4	32	52.5	19	31.1	61	100.0	6.78	0.033
	>2	16	37.2	20	46.5	7	16.3	43	100.0		
Place of work	IPD	18	28.1	34	53.1	12	18.8	64	100.0	3.575	0.167
	OPD	8	20.0	18	45.0	14	35.0	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 27.3% had good practice and 9.1% had poor practice of personal protective equipment. Among the study population with experience >2 years, only 37.2% had good practice and 16.3% had poor practice of personal protective equipment. Among the study population who worked in the wards, only 28.1% had good practice and 18.8% had poor practice of personal protective equipment.

Table 27: Bivariate analysis regarding Practice of Infection Control among the study population

		Practice on Infection control								Chi-square	p-value
		Good		Average		Poor		Total			
		N	%	N	%	N	%	N	%		
Training received	Yes	5	45.5	2	18.2	4	36.4	11	100.0	2.186*	0.335*
	No	38	40.9	40	43.0	15	16.1	93	100.0		
Experience	≤2	22	36.1	24	39.3	15	24.6	61	100.0	3.156*	0.206*
	>2	21	48.8	18	41.9	4	9.3	43	100.0		
Place of work	IPD	29	45.3	28	43.8	7	10.9	64	100.0	5.996	0.049
	OPD	14	35.0	14	35.0	12	30.0	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, only 45.5% had good practice and 36.4% had poor practice of infection control. Among the study population with experience >2 years, only 48.8% had good practice and 9.3% had poor practice of infection control. Among the study population who worked in the wards, only 45.3% had good practice and 10.9% had poor practice of infection control.

Table 28: Bivariate analysis regarding Practice of Biomedical waste management among the study population

		Practice on Biomedical waste management								Chi-square	p-value
		Good		Average		Poor		Total			
		N	%	N	%	N	%	N	%		
Training received	Yes	8	72.7	3	27.3	0	0.0	11	100.0	-	-
	No	67	72.0	21	22.6	5	5.4	93	100.0		
Experience	≤2	39	63.9	18	29.5	4	6.6	61	100.0	3.387*	0.183*
	>2	36	83.7	6	14.0	1	2.3	43	100.0		
Place of work	IPD	47	73.4	15	23.4	2	3.1	64	100.0	0.301*	0.860*
	OPD	28	70.0	9	22.5	3	7.5	40	100.0		

*****Yates corrected

Among the study population who had received training regarding standard precautions, 72.7% had good practice and 0.0% had poor practice of Biomedical waste management. Among the study population with experience >2 years, 83.7% had good practice and 2.3% had poor practice of Biomedical waste management. Among the study population who worked in the wards, only 73.4% had good practice and 3.1% had poor practice of Biomedical waste management.

Table 29: Bivariate analysis regarding Practice of Post Exposure Prophylaxis among the study population

		Practice on Post exposure prophylaxis					
		Good		Poor		Total	
		N	%	N	%	N	%
Training received	Yes	11	100.0	0	0.0	11	100.0
	No	77	82.8	16	17.2	93	100.0
Experience	≤2	50	82.0	11	18.0	61	100.0
	>2	38	88.4	5	11.6	43	100.0
Place of work	IPD	58	90.6	6	9.4	64	100.0
	OPD	30	75.0	10	25.0	40	100.0

Among the study population who had received training regarding standard precautions, 100% had good practice and 0.0% had poor practice of Post Exposure Prophylaxis.
Among the study population with experience >2 years, 88.4% had good practice and 11.6% had poor practice of Post Exposure Prophylaxis. Among the study population who worked in the wards, 90.6% had good practice and 9.4% had poor practice of Post Exposure Prophylaxis.

5. Discussion

Nurses are at great risk of blood borne infections. Most of them are because of occupational exposure. Universal precautions are very nicely designed and very effective to control blood borne infections. That will protect health care workers as well as patients from getting serious infections such as HIV, HBV and HCV. For that, proper knowledge and effective practices of universal precautions are very essential. Our study had assessed knowledge and practice of universal precautions in nurses working at our hospital [22].

5.1. Level of Awareness in Standard Precautions

Level of awareness in standard precautions was assessed taking good awareness, which means knowledge in all aspects of standard precautions on the criteria. The nurses had to answer all questions related to awareness in standard precautions to consider him as having good awareness. For easy analysis, standard precautions were divided into six elements and good awareness in each of these elements were analyzed.
Good awareness in standard precautions considering all the six elements was found that on 18.2% had good knowledge and 45.5% of the nurses had poor knowledge regarding hand hygiene.>2 years of experienced nurses had 23.3% good knowledge and 37.2% had poor knowledge regarding hand hygiene. Among the study population who worked in the wards, 15.6% had good knowledge, 48.4% had poor knowledge regarding hand hygiene.
When the six components of standard precautions were considered separately, it was found that 9.1% of nurses had good knowledge in infection control, 0% had good knowledge,81.8% had poor knowledge,>2 years of experienced nurses had only 2.3% good knowledge in PEP,81.8% good knowledge in waste disposal, 27.3% had good knowledge in SIP, 27.3% had good knowledge in PPE,18.2% had good knowledge in hand hygiene.
These findings are in conformation with a Nigerian study conducted in the year 2011 where the knowledge on hand hygiene among health care providers was 83% [5].

5.2. Level of Practice on Standard Precautions.

Level of practice in standard precautions was analyzed considering strict adherence to practice of all aspects of standard precautions as good practice. All the question in practice had to be answered positively to get labeled as having good practice [20].
When the individual elements in standard precautions were considered separately in all elements, our study showed that 63.6% of the nurses who have received training in standard precautions had good practice in hand hygiene and 0% had good practice in hand hygiene. Among>2 years of experienced nurses 74.4% had good practice and 4.7% had poor practice in hand hygiene and Our study showed that 27.3% of the nurses had good practice, among>2 years experienced nurses 37.2% had good practice on PPE.100% had good practice and among >2 years experienced nurses 88.4% on post exposure prophylaxis. 72.7%of the nurses had good practice and among >2 years experienced nurses 83.7% had good practice on waste disposal and 9.1% had good practice and among >2 years experienced nurses 25.6% had good practice on standard injections precautions,45.5% had good practice and among >2 years experienced nurses 48.8% had good practice on infection control.
On comparison with a study conducted regarding the practices of standard precautions among the health worker in Nigeria [2003] by Nelson and Sadolin and his team showed that only 63.8 % used personal protective equipment.94.8% practiced hand washing. Our study showed that 27.3% used personal protective equipments and 63.6% practiced hand washing [20].
On comparison with study regarding awareness and practice on standard precautions Kerala state health >50% had good hygiene and 33.7% nurses were immunized against Hepatitis B [21]. Our study showed that 18.2% had gone awareness in hand hygiene and 48.1% of nurses were immunized against Hepatitis B completely.
On comparison with study conducted in 2013 among nurses in private hospitals in Chennai [22] it was found that good practice in standard precautions was found in 97.4% of nurses. Our study showed that 33% of nurses had good practice in standard precautions.
Our study was done with small sample size and better study can be planned with more sample size. Future study can be planned with involving doctors, students and other healthcare workers.
From our study it is recommended that proper training should be provided to health care workers for universal precautions. Training should include hand hygiene, use of various personal protective equipments, prevention and treatment of needle stick injury and handling of biomedical waste. Information about universal precautions can be spread in the form of posters in different wards. Proper immunization of health care workers against HBV should be done. Personal protective equipments should be available in hospital in enough quantity. Post exposure prophylaxis training should be compulsory for health care workers [23].

6. Recommendations

Necessary steps to be initiated to improve the awareness and practice of standard precautions and inhibit the spread of hospital acquired infections. There has to be frequent trainings and retraining on standard precautions to all categories of staff in the form of Practical workshops. Strengthening of work site inspection and supervision of universal precautions. Mandatory Hepatitis-B vaccination for all the health care workers. Emphasis has to be laid on standard precautions in the Nursing curriculum.

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