
Knowledge and Hand Hygiene Practice of Healthcare Workers in the Prevention of Hospital Acquired Infections in Government Hospitals in Rivers State.

Joel Chituru, E. I. Achalu (Ph.D) & Ekenedo, Golda O. (Ph.D)

Department of human kinetics and Health education

University of Port Harcourt

smartjoseph03@gmail.com

Abstract

The study investigated the Knowledge and Hand Hygiene Practice of Healthcare Workers in the Prevention of Hospital Acquired Infections in Government Hospitals in Rivers State. The purpose was ascertaining the extent of knowledge and compliance to hand hygiene practice in the prevention of HAIs in government hospitals in Rivers State. Descriptive survey design, sample size of 1000 health care workers, the multistage sampling procedure, two research questions were answered while five hypotheses were tested at 0.05 alpha levels. The simple percentages and mean were used to answer the research questions while chi square and ANOVA was used to test the hypotheses. The findings revealed that the healthcare workers had a positive knowledge towards the prevention of HAIs with grand means of 3.32 higher than the criterion mean of 2.50 but this was not reflected in their practice of good hand hygiene. The hand hygiene compliance level to prevention of HAIs was poor, 39.6% of the respondents comply sometimes while 32.7% and 27.7% comply always and rarely respectively. Results further revealed that years of work experience had no influence while educational qualification had significant influence on knowledge and compliance to the prevention of HAIs with p -value < 0.05 . Conclusively, the healthcare workers have adequate knowledge of HAIs which never had an influence on their practice of hand hygiene for the prevention of HAIs due to poor monitoring. Recommendation was that there should be an effective and functional Centre for Disease Control and monitoring team to enforce compliance with the policies and guiding principles for preventing HAIs especially hand hygiene indications through punishment and reward in all healthcare facilities in the state.

Key words: *knowledge, Hospital Acquired Infections, Practice, healthcare workers, Prevention.*

Introduction

Health care system has a significant duty of saving lives, providing preventive, curative and rehabilitative services and keeping the people healthy. Towards achieving this, there has been several advancement in the technology of healthcare facilities, yet the scourge of Hospital Acquired Infection (HAIs) in the health care sectors has been on the increase. The healthcare professionals in particular are often exposed to various pathogens on of course of carrying out their nursing activities (Kosgeroglu, Ayranci, Vardareli, & Dincer, 2004) hence are vectors which patients who assess the facility become vulnerable to and finally result in another ill health other than the one they were originally diagnosed with on assessing the health facilities, this ill health is known and referred to as Hospital Acquired Infections .

Hospital-Acquired Infections (HAIs) refers to infection that is acquired during the process of hospital care and not manifested at the time of admission to a hospital or other health-care

facility (Nejad, Allegranzi, Syed, Ellis, & Pittet, 2011). HAIs are also infections occurring in a patient during the process of care in a hospital or other health-care facility that was not obvious or incubating while on admission. They can be acquired in the hospital and any other health facility where patients receive healthcare and may appear even after discharge. It has been estimated that the risk of health care-associated infection is 2 to 20 times higher in developing countries compared to developed countries and 5% and 10% of patients admitted to hospitals in developed countries acquire these infections (WHO, 2008). They also account for protracted illness, prolonged hospital stay, potential disability, excess costs and sometimes death.

The healthcare workers have been identified to be a serious vector in the spread of HAIs on course of the discharge of their duties. This was apparent in the study of Semmelweis of 1932 which revealed that puerperal fever was common in the maternity where physicians and medical students took delivery of mothers in the labour room from the theatre without washing their hands properly thereby encouraging the spread of Hospital Acquired Infection (HAI), This obviously suggested hand hygiene as a means of preventing the occurrence of HAIs yet the compliance rate from studies have been very low (Akyol, 2007).

Hand hygiene is referred to as any method that removes or destroys microorganisms on hands. Hand washing is an act of cleaning ones hand with or without the use of soap and water, combination of other liquid with soap or ash with the intention of removing dirt, soil and micro-organism from the hands, (CDC, 2013). It includes all the method and strategies used to remove or rid the hands of micro - organism. Hand washing is defined as the vigorous but brief rubbing together of all surfaces of lathered hands, followed by rinsing under a stream of water. It is an act of cleaning ones hand with cleaning agents or treatment of the hands with an antiseptic agent. Hand hygiene involves washing the hands with some agents to achieve its purpose. Hand washing suspends microorganisms and mechanically removes them by rinsing with water. The fundamental principle of hand washing is removal of germs causing diseases not killing them.

Types of Hand Washing

There are basically three forms of hand washing; they are social (routine) hand washing, hygienic hand washing and surgical hand wash. Social hand wash is that which is performed to render the hands physically clean and to remove transient micro-organism. It is an effective infection control quality and a vital strategy to reduce the explosion of infection. This is done before and after a shift, preparing and after handling food, before and after contact with patient, before and after contact with cleaning the surrounding, wearing and removing gloves as well as before and after contact with body fluid. Surgical hand wash refers to the hand wash done to reduce resident micro organisms during surgical process in order to reduce the risk of infecting wound in case the gloves gets damaged, this could be done before the procedure using 4% chlorhexidine gluconate or 7.5% povidine iodine, (National Patient Safety Agency, 2009).

Hand hygiene practice varies according to the Agents used. Antiseptic hand washing refers to washing hands with soap and water or other detergents containing an antiseptic agent. Antiseptic hand-rubbing applies to the use of antiseptic Hand-rub (Sanitizer) to reduce the growth of any micro-organism without application of water for washing or rinsing the hands. The practice of Hand antisepsis/decontamination/ degerming is same as in antisepsis hand rubbing. Applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms

without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices (CDC, 2011).

Hygienic hand antisepsis refers to treatment of hands with either an antiseptic hand rub or antiseptic hand wash to reduce the transient microbial flora without necessarily affecting the resident skin flora. Hand washing is only proper when done with soap and water under running water or of alcohol based liquid or hand formula soap, etc. Hand wash with soap and water removes micro-organisms from skin, the agent reduce barrier to solution and increase solubility as fat and protein which are part of the soil component but can only be removed from the skin by soap. Oil is only removed by soap or hot/warm water.

The prevention of diseases means reduction of morbidity and mortality rate as well as promotion of good health which is one of the basic principles of health promotion; this indicates a strong relationship between hand washing and health promotion. Proper hand hygiene is the single most important, simplest, least expensive and simplest means of reducing the prevalence of HAIs and the spread of antimicrobial resistance.

Several studies have demonstrated that hand washing virtually eradicates the carriage of MRSA which invariably occurs on the hands of healthcare workers on course of their duty. The study conducted by Stein, Makarawo, & Ahmad (2003) reveals that after implementing a hand hygiene promotion program with strict compliance, hand hygiene among nursing personnel improved significantly from 6.3% before the program to 81.2% 7 months after the program, this confirms that the compliance and education of the healthcare workers are significant in the prevention of HAIs. The study also showed that about half of the respondents were found to have fair knowledge of infection control while approximately two thirds of the study group hadn't had previous courses on infection control, if the education is not there how can the right knowledge be acquired? Education is a critical element in the training of all HCWs, particularly in countries where there is a lack of formal and well-organized infection control programs. The study conducted by Agaral and Thomas (2003) also reveals that poor knowledge of prevention of HAIs correlates the occurrence of HAIs in hospitals.

Knowledge has been conceptualized in several ways by different scholars, knowledge in this regards is the awareness of factors associated with something (HAIs). This simple implies that for a healthcare worker to be confirmed as being knowledgeable of the hospital acquired infection, he or she must be very much aware of what constitutes a risk or predisposing factors to HAIs, modes of transmission, pathogens associated with each type of HAIs, their various signs and symptoms and their preventive measures. HCWs with knowledge of HAIs have challenges of complying with the basic guidelines and recommendations for the prevention of HAIs.

Limitations to hand hygiene compliance

Studies have shown that factors like poor hand hygiene is responsible for 40% of Hospital Acquired Infections occurrence, accessibility of hand washing facilities and supplies such as the alcohol gel (Horan, Andrus & Dureck, 2008), lack of Centre for Disease Control (CDC), poor knowledge of use of indwelling device (catheters), inadequate knowledge of prevention and infection control procedures (Toni & Lee, 2004) are responsible for the occurrence of HAIs. There are various factors influencing compliance with hand hygiene, they can be referred to as the group and institutional factors. The group level factors include lack of education and performance feedback; high level of workload, lack of role model and

understaffing while the institutional factors include absence of written guidelines, paucity of appropriate hand hygiene agents, lack of skin care promotion and agents; inadequate facilities for hand hygiene, poor administrative leadership and Interventions to promote hand hygiene in hospitals. (Akyol 2007; Kampf & Loffler 2010; Mani et al. 2010). Unavailability of facilities is even worse in developing countries. Ogunsola & Adesiji (2008).

Suchitra and Lakshmi, (2007) on impact of education on knowledge, attitudes and practice of different categories of healthcare workers associated poor compliance with lack of awareness among personnel. This confirms that, education results in knowledge which creates awareness for compliance to the policy or guiding principles, other factors responsible for poor compliance as identified are workload, poor facilities and supplies. Larson and Killien (1982) also identified poor knowledge of hand hygiene and lack of knowledge or experience, among others as barriers to effective hand hygiene.

The occurrence or incident rate of HAIs is alarming especially in developing countries as shown in Studies of various scholars most of which are attributed to poor compliance level of HCWs USA 50%, Switzerland 42%, UK 32%, France 6.9% and Nigeria 50% - 72% consequently, in USA 1.7million -2 million patients are affected by HAIs annually while 88-99 thousand deaths annually are attributed to HAIs, (Trampuz & widmer, 2004). In another development, Takahashi & Turale, (2010) posit that in UK, 500 deaths are attributed to HAIs annually and Canada has 8,000 deaths are also attributed to HAIs annually with an expenditure of 100 million dollars annually in treating patients with HAIs. In Europe, Eastern Mediterranean, South-East Asia and Western Pacific, studies showed an average of 8.7% of hospital patients had HAIs, over 1.4 million people worldwide suffer from infectious complications acquired in hospital (3). The highest frequencies of nosocomial infections were reported from hospitals in the Eastern Mediterranean and South-East Asia Regions (11.8 and 10.0% respectively), with a prevalence of 7.7 and 9.0% respectively in the European and Western Pacific Regions, (WHO, 2002)

This study assumes the application of one major theory which is the Health Belief Model. The theory explains that individuals cue into preventive action when they are convinced that such action produces positive results. The theory in relation to this study can be translated as the perception of the HCWs susceptibility to HAIs, benefits of being aware of the causes and preventive measures and compliance as well as the possible barriers to effective compliance. However, two research questions and four hypotheses provided a guide for the study

Research questions

1. What is the knowledge of healthcare workers in the prevention of HAIs in government hospitals in Rivers State?
2. What is the extent of hand hygiene compliance in the prevention of HAIs among health care workers of government hospitals in Rivers State?

Hypothesis

1. Knowledge of healthcare workers has no significant influence in the prevention of Hospital Acquired Infections among HCW infection in government hospitals Rivers State.
2. Work Experience has no significant influence in the knowledge of healthcare workers in the prevention of HAIs in government hospitals in Rivers State.

3. Educational qualification has no significant influence in the knowledge of healthcare workers in the prevention of HAIs in government hospitals in Rivers State.
4. Educational qualification has no significant influence in the compliance of healthcare workers in the prevention of HAIs in government hospitals in Rivers State.
5. Work Experience has no significant influence in the compliance of healthcare workers in the prevention of HAIs in government hospitals in Rivers State.

Methodology

The descriptive research design was used for the study. The design describes features of the sample the way they are at the time of study and as they occur in their natural setting without it being influenced or manipulated by the researcher. The population of the study was composed of 1,733 (978 and 755 Healthcare workers from the secondary and tertiary healthcare institution respectively) healthcare workers in government hospitals in Rivers State. The sample size 1000 respondents was used for the study and was drawn from both the secondary and tertiary healthcare institution in the state using a minimum of 50% of the entire population.

The multi – stage sampling procedure was adopted in selecting the sample for the study. Firstly the purposive sampling technique was used to sample for the tertiary health institution while the cluster sampling technique was used to divide Rivers state into 3 clusters of senatorial Districts (Rivers East, Rivers West and Rivers South). The Local Government Areas (LGAs) of the State was arranged under these sub heads to obtain 9LGAs, 7LGAs and 7LGAs for Rivers West, Rivers South and Rivers East senatorial zones respectively.

The simple random sampling (ballot without replacement) was used to draw 13LGAs from the 23LGAs in the 3 strata (5 LGAs from Rivers West Senatorial District, 4 from Rivers South Senatorial District and 4 from Rivers East Senatorial District). The proportional stratified random sampling technique was used to establish the sample size for the study using a uniform percentage of 50% minimum to draw a sample size of 1000. (103 HCWs from RWSD, 91 HCWs from RSSD and 356 HCWs from the secondary healthcare institution and 450 HCWs from the tertiary health institution.)

Instrument for data collection was a self structured questionnaire titled “Factors Associated with the prevention of Hospital Acquired Infections questionnaire” (FRHAIQ). The questionnaire was in two sections, “A and B”. section A, contain 8 items sourcing for demographic information while section B, containing 17 items sourced information for the variables under study using the modified likert scale response options of Strongly Agreed (SA), Agreed (A), Disagree (D) and Strongly Disagree (SD). The items in the questionnaire were validated by three experts in the department of Human Kinetics and Health Education department, university of Port Harcourt and the one regarded as inappropriate were eliminated. The reliability of the instrument was determined using Pearson Product Moment Correlation using the test-retest method. The instrument was considered reliable as a coefficient of 0.75 was obtained. The questionnaire administration and collection was done by the researcher and 5 other trained research assistants and the copies distributed were collected on the spot. The data were analysed using simple percentage (%) and mean (2.50) to answer the research questions while the chi square and ANOVA was used to test the hypothesis at 0.05 alpha levels using the statistical package of social sciences (SPSS).

Results

Research Question 1 What is the knowledge of health care worker in the prevention of Hospital Acquired Infections in government hospitals in Rivers State?

Table 1 knowledge of prevention of HAIs

Prevention of HAIs	X	±	Mean Criterion	Decision
Hospital Acquired Infections (HAIs) are infections acquired from the Hospital environments	3.39	0.76	2.50	Positive
Hospital Acquired Infections can be spread through contact with hands of the Health Care Workers.(HCW)	3.21	0.59		Positive
Use of water only is not an effective Hand wash techniques.	3.11	0.73		Positive
Healthcare Workers are at risk of Hospital Acquired Infections.	3.19	0.80		Positive
Hospital and patients immediate environment is favourable to HAIs.	2.40	0.97		Positive
Hospital Acquired Infections (HAIs) can be got through surgical procedure.	3.17	0.68		Positive
Hand Hygiene before and after patient care can prevent HAIs.	2.78	0.61		Positive
Organisms from HCW and contaminated surfaces can result in HAI.	3.14	0.67		Positive
The bed pan is a source of Hospital Acquired Infections.	3.23	0.73		Positive
Grand mean.	3.07	0.73		Positive

Criterion of 2.50 was used to establish decision. Mean score < 2.50 is regarded as poor knowledge while mean score > 2.50 was regarded to be adequate. The table with a mean score of 3.07> criterion mean 2.50 indicates a positive and adequate knowledge of the HCWs in the prevention of hospital acquired infection in government hospitals in Rivers State.

Research question 2: what is the extent of hand hygiene compliance in the prevention of HAIs among patients in government hospitals in Rivers State?

Table 2: Extent of Hand Washing Compliance

S/N	Hand Hygiene Practice	Always		Sometimes		Rarely	
		Freq.	%	Freq.	%	Freq.	%
1.	Indication of hand washing						
	Washing of hands before donning gloves	140	14	291	29.1	569	56.9
	Wash of hands after removing gloves	356	35.6	482	48.2	162	16.2
	Washing of hands before contact with patient	263	26.3	240	24	497	49.7
	Washing of hands after contact with patient	483	48.3	352	35.2	165	16.5
	Washing of hands before any procedure	264	26.4	589	58.9	147	14.7
	Washing of hands after any procedure	394	39.4	386	38.6	220	22

Washing of hands after contact with Surface	172	17.2	401	40.1	43.7	43.7
Washing of hands when clearly dirt	540	54	430	43	30	3
Grand Percentage		32.7		39.6		27.7

The Table 2: revealed the overall compliance to hand washing indication practice and agents used. The table showed that 39.6% of the respondents sometimes comply with the indications, 32.7% always comply while 27.7% of the total respondents rarely comply with it.

Hypothesis 1: Knowledge of HCW has no significant influence in the prevention of hospital acquired infection in government hospitals in Rivers State.

X ² Cal	X ² Crt.	Df	Sig.	Decision
270.401	3.841	1	0.05	Ho rejected

Table 3 Analysis on influence of knowledge of healthcare workers in the prevention of HAIs in government hospitals in rivers state. The table above with the use of chi square revealed that the x² calculated value (270.40) is greater than the x² critical value (3.841) at degree of freedom 1 set at 0.05 alpha level hence, the null hypothesis was rejected. Thus, knowledge of HCW has a significant influence in the prevention of HAIs in government hospitals in Rivers State.

Hypothesis 2: Work experience has no significant influence on the knowledge of health care workers in the prevention of HAIs among patient in government hospitals in Rivers State.

Table 4: Analysis on influence of work experience on knowledge of healthcare workers in the prevention of HAIs in government hospitals in Rivers state

ANOVA						
Source	Sum of Squares	Df	Mean Square	F	F crit.	P-Value
Between group	.419	3	.1397	.0305	2.60	.061
Within group	4561.305	996	4.5796			
Total	4561.724	999				

The findings of the study as revealed in the table shows that F-calculated value (.0305) is less than F-critical value (2.60) which indicates a non-significant influence of work experience on knowledge of healthcare workers in the prevention of HAIs (p>0.05). The null hypothesis which states that work experience has no significant influence on knowledge of health care workers in the prevention of HAIs is therefore retained.

Hypothesis 3: Educational qualification has no significant influence on the knowledge of health care workers in the prevention of HAIs in government hospitals in Rivers State.

Table 5: Analysis on influence of Educational qualification on knowledge of healthcare workers in the prevention of HAIs in government hospitals in Rivers State

ANOVA						
Source	Sum of Squares	Df	Mean Square	F	F crit.	P-Value
Between group	3.828	1	3.829	.838	.360	.002
Within group	4557.895	998	4.567			
Total	4561.724	999				

The hypothesis states that Educational qualification has no significant influence on knowledge of healthcare workers in the prevention of HAIs. The result of the study revealed that the F- calculated value (.838) is higher than the F- critical (.360) which indicates significant influence of Educational qualification on knowledge of healthcare workers in the prevention of HAIs ($p < 0.05$). The null hypothesis is therefore rejected.

Hypothesis 4 : Educational qualification has no significant influence in the compliance of the healthcare workers in the prevention of HAIs in government hospitals in Rivers State

Table 6: Analysis on influence of educational qualification on compliance of healthcare workers in the prevention of HAIs in government hospitals in rivers state based on qualification.

ANOVA						
Model	Sum of Squares	df	Mean Square	F	F crit.	P-value
Between group	.437	1	.437	.108	.743	.355
Within group	4043.707	998	4.052			
Total	4044.144	999				

The findings of the study as indicated in the table above revealed that the calculated value (.108) is lower than the critical value (.743) and the $p > 0.05$, this however shows a non - significant influence of educational qualification on compliance of health care workers in the prevention of HAIs, the null hypothesis is therefore retained

Hypothesis 5: Work Experience has no significant influence in the compliance of healthcare workers in the prevention of HAIs in government hospitals in Rivers State.

Table 7: Analysis on influence of work experience on compliance of healthcare workers in the prevention of HAIs in government hospitals in Rivers State

ANOVA

Model	Sum of Squares	Df	Mean Square	F	F crit.	P-Value
Between group	.036	1	.036	.009	.925	.246
Within group	4044.108	998	4.052			
Total	4044.144	999				

The findings of the study revealed a non - significant influence of work experience on compliance of health care workers in the prevention of HAIs. The P-value of .925 is higher than the calculated value .009. The hypothesis which states that experience will not significantly influence the compliance of health care workers in the prevention of HAIs is therefore retained.

Discussion

Based on the findings of the study on if knowledge of HCW has a significant influence in the prevention of HALs in government hospitals in Rivers State. The practice or compliance to prevention of HAIs guideline are made possible when one is aware of what constitutes a risk or predisposing factors to HAIs, modes of transmission, pathogens associated with each type of HAIs, their various signs and symptoms and their preventive measures, hence, knowledge is important in the prevention of HAIs. However, this is in agreement with the findings of Agaral and Thomas (2003) which stated that poor knowledge of prevention of HAIs correlates the occurrence of HAIs in hospitals and Toni & Lee (2004), also posited that inadequate knowledge of prevention and infection control procedure are responsible for the occurrence of HAIs.

The study further revealed that compliance level of the respondents is low despite the good knowledge of the respondents. Work experience has no significant influence on knowledge and compliance level of the respondents towards the prevention of Hospital Acquired Infections (HAIs) but educational qualification has a significant influence on both knowledge and compliance in the prevention of Hospital Acquired Infections. This could be due to lack of continuity in sustenance of knowledge acquired through training or other factors like personal and organisational attitudes towards interventions, such as, hand washing, cost containment and logistical barriers, poor monitoring, in availability of resources, and disciplinary measures for poor compliance (Stein, Makarawo, & Ahmad, 2003.)

One can only comply with what he or she is aware or knowledgeable of, knowledge of this only comes through education which brings about compliance. Egwu (2006), confirms this when he declared that for a healthcare delivery system to be successful, education concerning prevention of health problems and methods of preventing them should be given a critical consideration. WHO (2009), guideline for prevention of HAI provides that, there should be a disease control centre composed of trained health care workers that will retrain others, this also is lacking or ineffective in the healthcare facilities which accounts for why prevention of HAIs is very low.

Conclusion

Hospital Acquired Infections are public health issues associated with healthcare workers and patient who assess the healthcare facility. The implication ranges from prolonged hospital stay, cost effectiveness, delay in recovery, incapacitation and in most cases death. Knowledge which should serve as a pointer to areas of problem Lack of knowledge and experience, lack

of knowledge of guidelines and recommendations are found to be associated with prevention of HAIs among patients and healthcare workers. The health institutions and its allied bodies should regularly train the HCWs on prevention of HAIs. The management should take proactive measures to ensure complete compliance with the guidelines to keep our hospitals free and save from HAIs even as our HCWs remain healthy to do their primary assignment of saving lives and restoring health.

Suggestion

Based on the findings and conclusions the following suggestions are made;

1. An effective and functional Centre for Disease Control should be established in all healthcare institution in the State.
2. All healthcare workers should be sent regularly for training on prevention of HAIs.
3. There should be a monitoring team to enforce compliance with the policies and guiding principles for preventing HAIs especially, hand hygiene indications through punishment and rewards.
4. Hand hygiene products should be made accessible to all HCWs irrespective of their position and distances while on duty with strict monitoring from the centre for disease control unit.

References

- Agaral M, Thomas P. (2003) Prevalence of post op nosocomial infection in neuro surgical patients and associated risk factors-a prospective study .*NIJ*. Sept;107(3):625 – 620
- Akyol, A.D. (2007), Hand Hygiene among nurses in Turkey, opinions and practice, *journal of clinical nursing* 16, 431-437.
- Horan TC, Andrus M, Dureck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control*. 2008;36:309–32.
- Kosgeroglu, N., Ayranci, U., Vardareli, E., & Dincer, S. (2004). Occupational exposure to hepatitis infection among Turkish nurses: frequency of needle exposure, sharps Injuries and vaccination. *Epidemiol Infect*, 132(1), 27-33, <http://dx.doi.org/10.1017/S0950268803001407>.
- Larson E, Killien M, (1982) factors influencing hand washing behavior of patient care personnel. *Am j infect control* : 10: 93-9
- National Patient Safety Agency (2008): Clean Hands Saves Lives. Patient Safety Alert
- Nejad S.B., Allegranzi B., Syed S.B., Ellis B., Pittet D., (2011). Health-care-associated infection in Africa: a systematic review. *Bulletin of the World Health Organization*; 89:757-765.
- Stein, A.D., Makarawo, T.P., & Ahmad, M.F., (2003). A survey of doctors' and nurses' knowledge, attitudes and compliance with infection control guidelines in Birmingham teaching hospitals. *Journal of Hospital Infection*. 54 (1), 68-73.
- Suchitra J B, Lakshmi D N, (2007), impact of education on knowledge, attitudes and practices among various categories of healthcare workers on nosocomial infections. *Indian j med microbial*, 25: 181-7.
- Toni R. & Lee-Culvert L. (2004) Hospital-Acquired infection, [http://www.surgeryencyclopedia.com/FL-la/Hospital/-Acquire infection.htm](http://www.surgeryencyclopedia.com/FL-la/Hospital/-Acquire%20infection.htm).
- Trampuz, A. & Widmer, A.F (2004) 'Hand hygiene: a frequently missed lifesaving opportunity during patient care'. *Mayo Clinic Proceedings* 79 (1), 109-116.
- World Health Organization [WHO]. (2008).The first Global Patient safety challenge: “Clean care is safer care”. Geniva: WHO.
<http://www.who.int/gpsc/background/en/index.html>.

World Health Organization (WHO) (2009): Participates at 6th Global Conference in Health Promotion – Bangkok Charter for Health promotion in Globalize world.