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THE KNOWLEDGE AND COMPLIANCE WITH THE UNIVERSAL PRECAUTIONS AND THE PREVALENCE OF PERCUTANEOUS INJURIES AMONG REGISTERED NURSES IN SELECTED COUNTY HOSPITALS IN KENYA.

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ABSTRACT

Objective: To establish the level of knowledge and compliance with the Universal Precautions and the prevalence of Percutaneous injuries among Registered nurses in Selected County Referral Hospitals in Kenya.

Design: A cross-sectional hospital-based quantitative study.

Setting: Baringo County Referral Hospital and Nandi County Referral Hospital both of which are situated in the Rift Valley Region of Kenya.

Subjects: The respondents were all the Registered Nurses in the selected County Referral Hospitals.

Results: The study established that the majority (87.6%, n=145) of the Registered Nurses are considered knowledgeable on the Universal Precaution. The difference between the means in knowledge scores of the two groups is significant at the 0.01 level, $t(143)=3.820$, $p<0.01$.

Those who were Compliant with the Universal Precautions was a minority (42.1%, n=145). Compliance with the Universal Precautions and was predicted by knowledge on the Universal Precautions ($R^2=0.25$, $p<0.01$).

A majority (57.2%, n=145) of the respondents had experienced at least one percutaneous injuries with those afflicted recording an average of 2.2 (SD=1.3) injuries per person in the last five years. Using Logistic Regression, it was established that Odds ratio of getting afflicted with Percutaneous Injuries comparing by gender is 0.47, 95%CI= (0.22-0.99). Simple linear regression established that the number of percutaneous injuries are predicted by age ($R^2=0.48$, $p<0.01$) and experience in years ($R^2=0.59$, $p<0.01$).

Conclusion: The study concluded that the level of knowledge of the Universal Precautions among the Registered Nurses is very good but is not corresponding to the relatively average compliance of the same Universal Precautions. Knowledge of the Universal Precautions was identified as a predictor to compliance with the Universal Precautions. Percutaneous Injuries occurrences are common to the Registered Nurses and most of those affected are reluctant to report to the authorities for further management.

Keywords: Percutaneous Injuries, Universal Precautions, Standard Precautions, Compliance.

INTRODUCTION

Health care workers are exposed to a couple of hazards on the duty, including percutaneous injuries, musculoskeletal injuries, allergy to diagnostic/therapeutic apparatus, physical assault, and stress. As much as these occupational hazards are manageable if not preventable, healthcare workers continue to experience injuries and preventable illnesses in the workplace. The incidences of nonfatal occupational injuries and illness among to healthcare workers are

among the highest of any industry sector 1. Healthcare workers have a high risk of occupational exposure to Percutaneous injuries and blood splashes on the skin which is a major concern²⁻³, particularly in developing countries, with high incidence of blood borne diseases and prevalence of unsafe sharps handling practices. Such injuries can lead to serious and fatal infections with bloodborne pathogens such as hepatitis B virus, hepatitis C virus, or human immunodeficiency virus⁴.

Health care workers have in the past become infected with blood-borne illnesses the line of their duties either via percutaneous injuries or exposures to contaminated blood/fluids to mucosal membranes. They further assert that the fear of contracting blood-borne illnesses/infections on duty is a considerable concern for many health care workers⁵.

Nurses comprise the backbone of the healthcare system and are principle caregivers to people living with HIV/AIDS⁶. Nurses are at a greater risk of percutaneous injuries than any other group of health care workers and that the proportion of nurses among all health-care workers at risk in the International Labor Organization database was generally between 35% and 50%⁷. Percutaneous injuries to the nurses prevalence in Rift Valley Provincial Hospital is estimated around fifty three percent(53%)⁸.

To mitigate this Center for Disease Control introduced the Universal Precautions which were intended to prevent parenteral, mucous membrane and non-intact skin exposures of health workers to blood-borne pathogens. The Universal Precautions assumes that blood and body fluids of all patients are considered potentially infectious and a such highly recommends use of protective barriers and prudent management of hospital wastes¹. The Universal Precautions is a package of infection prevention and control practice applied in the clinical set up by the health providers to reduce the risk of transmission of blood borne infections. They include guidelines and principles in hand washing, use of gloves and other protective barriers eg aprons, gowns, goggles and masks, proper handling of sharps, disinfection of soiled instruments and linen and proper management of sharp injuries⁹.

It is therefore imperative that the nurses are well equipped with adequate knowledge on the Universal Precaution but more importantly that they practice its provisions and tenets.

METHODS AND MATERIALS

Study Area: The study was carried in both Baringo County Referral Hospital and Nandi county Referral Hospital. The two hospital were purposively selected for both teaching and referral facilities. They are both situated in the Rift Valley region of Kenya. This study aimed at establishing the prevalence of percutaneous injuries, the level of knowledge and the extent of compliance with the Universal Precautions.

Study Design: This was a descriptive cross-sectional institutional-based study carried out for a period of one month simultaneously in the two sites.

Study Population and Sampling: The study population was the Registered Nurses in the two selected hospitals. Total Population Sampling approach was employed owing to relatively small size of the population. the entire population stood

at 160. The study assumed 95% Confidence Interval. The response rate was around 91%.

Data collection tools: A pretested structured self-administered questionnaires was administered to the Registered Nurses to collect quantitative data such as demographic characteristics, knowledge and compliance with Universal Precautions and Percutaneous injuries.

Methods of Data analysis and presentation: All information was entered into computer software for analysis, using statistical package for social sciences (SPSS) version 22 computer package and analyzed using descriptive and inferential statistics. The inferential statistics methods employed include independent t-test to compare means of continuous variables between groups, Chi Square to check for level of association between categorical variables, Simple Linear Regression to measure the of prediction of continuous outcome variables and finally Logistic Regression to measure the of prediction of dichotomous outcome variables. Descriptive data was presented using graphically and in text.

Ethical considerations: Ethical clearance was obtained from the University of Nairobi / Kenyatta National Hospital Ethics and research Committee. Informed and written consent was sought, obtained from all participants after explaining the nature and aim of the study and before administering the questionnaire. The study was purely voluntary.

RESULTS

Socio-demographics: This study was conducted in 2015 and the response rate for this study was around 91% (n=160). At the respondents were Registered Nurses. The results in the following Table 1 shows that majority of the respondents came from Baringo County Referral Hospital (52%), were of Female gender (73%), were married (76%) and professed Christian faith (99%).

The general mean age of the respondents is at 36.6 years(SD=7.1) while the specific mean age for the respondents in Baringo County Referral Hospital(BCRH) was lower (36.4 years, SD 5.8) than that of Nandi County Referral Hospital (NCRH) (36.8 years, SD=8.4).

The general mean number of practice years(experience) is 12.43(SD=7.06) but the specific for the respondents in BCRH was lower (11.4 years, SD 5.8) was lower than that of NCRH (13.5 years, SD=8.2).

Self-reported Knowledge on the Universal Precautions: On the concept of knowledge of the Universal Precautions, a set of twelve (12) questionnaire items were presented to the respondents to indicate the best and correct response. The items were later recoded with the correct response getting one(1) point while the incorrect responses were getting

zero(0) points. After the recoding we computed new variable that is a sum of all the knowledge scores. The maximum score being twelve (12) points and the minimum being zero (0) points. The study assumes that for one to be considered knowledgeable to the Universal Precaution, the respondent must score above 50% which translates to at least seven(7) points. This study established that an overwhelming majority(87.6%. n=145) were knowledgeable on the Universal Precautions as elaborated in the following Table 2.

The general mean knowledge score was 8.5(SD=1.7) out of the possible 12 points which translates to 71% .The results in the following Table 3 shows that the difference between the mean knowledge scores (M=8.0, SD=1.7) of Nandi County Referral Hospital was slightly lower than that(M=9.0, SD=1.6) of Baringo County Referral Hospital. The difference between the means in knowledge scores of the two groups is significant at the 0.01 level, $t(143)=3.820$, $p<0.01$.

Table 1

The sample of the respondents by some Socio-demographic characteristics

	Frequency	Percentage
Hospital n=145		
Baringo County Referral Hospital	75	51.7
Nandi County Referral Hospital	70	48.3
Gender n=145		
Male	39	26.9
Female	106	73.1
Marital status n=145		
Single	24	16.6
Married	110	75.9
Widowed/Divorced	11	7.5
Religion n=145		
Christianity	143	98.6
Islam	2	1.4

Table 2

The Self-reported Knowledge on UP

	Frequency	Percentage
Not knowledgeable (Score 0-5)	18	12.4
Somewhat knowledgeable (Score 6-8)	84	57.9
Highly knowledgeable (Score 9-12)	43	29.7

Table 3

Comparison by Hospital of the mean knowledge Scores

Hospital	n	Mean knowledge scores	SD	df	t-value	p-value
Baringo	75	9.0 (75%)	1.6	143	3.820	0.000
Nandi	70	8.0 (66.7%)	1.7			

Self-reported Compliance with the Universal Precautions: On the concept of compliance with the Universal Precaution, a set of eight (8) statements were put on five (5) point Likert Scale in which the respondents were to indicate their level of agreement or otherwise. The items were recoded with the correct response getting one(1) point while the incorrect responses were getting zero(0) points. After the recoding we computed new variable that is a sum of all the scores. The maximum score being eight (8) points and the minimum being zero (0) points. The study assumes that for one to be considered compliant with the Universal Precaution, the respondent must score above 50% which translates to at least five(5) points. This study established that a minority (42.1%, n=145) of the respondents were compliant to the Universal Precautions as elaborated in the following Table 4.

A simple linear regression was calculated to predict compliance with the Universal Precautions (UP) based on knowledge of the Universal Precautions. A significant regression equation was found ($F(4,78)=6.41$, $p<0.01$), with an $R^2=0.25$. Participants predicted knowledge scores of UP is equal to $3.01+0.33(\text{age})$ scores when age is measured in years.

Prevalence of Percutaneous Injuries: Slightly more than half (57.2%, n=145) of all the respondents have had ever had at least one percutaneous injuries but the specific prevalence per hospital favoured Baringo County Referral Hospital respondents (53.3%, n=75) compared to Nandi County Referral Hospital respondents had more injuries (61.4%, n=70). The prevalence of percutaneous injuries was higher in the female (62.3%, n=106) than that of the males respondents (43.6%, n=39).

The level of association between prevalence of percutaneous injuries and gender is significant, $X^2(1, N=145)=4.062$, $p<0.05$. On further subjecting the same association to Logistic Regression, it was established that Odds ratio of getting afflicted with Percutaneous Injuries comparing by gender is 0.47, 95%CI= (0.22-0.99). On average the odds of getting afflicted with Percutaneous injuries is 0.47 times higher in females than male respondents.

Other categorical variables found not significantly associated with proportion of Percutaneous injuries are the hospital, department of work and attendance of Continuous Professional Development on the subject matter as illustrated in following Table 6.

The general mean compliance score was 4.2 (SD=1.3) out of the possible 8 points which translates to 52.5%. The results in the following Table 5 reveals that the difference between the mean compliance scores ($M=3.7$, $SD=1.3$) of Nandi County Referral Hospital was slightly lower than that ($M=4.71$, $SD=1.2$) of Baringo County Referral Hospital. The difference between the means of the mean compliance scores of the two groups was significant at the 0.01 level, $t(143)=4.972$, $p<0.01$.

The general mean number of percutaneous injuries to those who had been afflicted in the last five years was 2.2 (SD=1.3). The results in the following Table 7 reveals that the difference between the mean percutaneous injuries ($M=2.44$, $SD=1.45$) of Nandi County Referral Hospital was slightly higher than that ($M=1.98$, $SD=1.19$) of Baringo County Referral Hospital. The difference between the means of percutaneous injuries of the two groups was not significant at the 0.05 level, $t(81)=-1.596$, $p>0.05$

Table 4

The Self-reported Compliance with the Universal Precautions

	Frequency	Percentage
Not compliant (Score 0-4)	84	57.9
Somewhat compliant (Score 5-6)	59	40.7
Highly compliant (Score 7-8)	2	1.4

Table 5

Comparison by Hospital of the mean Compliance Scores

Hospital	n	Mean compliance scores	SD	df	t-value	p-value
Baringo	75	4.7	1.2	143	4.972	0.000
Nandi	70	3.7	1.3			

Table 6.

Comparison by some Categorical variables the proportion of Percutaneous Injuries

Variable	Scale	value	df	p-value
Hospital	Pearson Chi-Square	0.969	1	0.325
	N	83		
Work placement(Dept)	Pearson Chi-Square	9.994	5	0.075
	N	83		
Attendance of CPD	Pearson Chi-Square	0.035	1	0.851
	N	83		

Table 7

Comparison by Hospital of the mean Percutaneous injuries

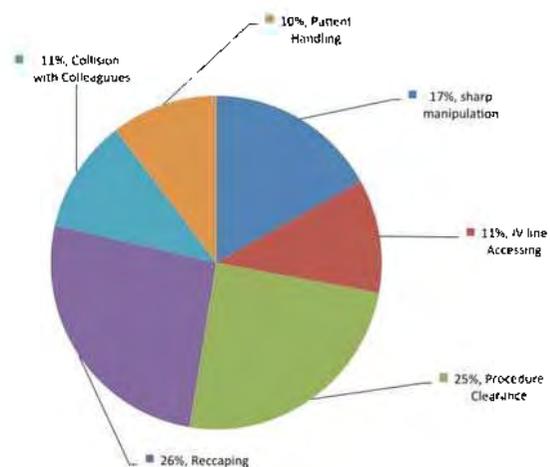
Hospital	n	Mean PI	SD	df	t-value	p-value
Baringo	40	1.98	1.19	81	-1.596	0.114
Nandi	43	2.44	1.45			

A simple linear regression was calculated to predict the number of percutaneous injuries to the affected based on age of the respondents. A significant regression equation was found ($F(1,81)=75.56, p<0.01$), with an $R^2=0.48$. The respondents predicted number of percutaneous injuries is equal to $-3.09+ 0.14(\text{age})$ percutaneous injuries when age is measured in years. Secondly, simple linear regression was calculated to predict the number of percutaneous injuries to the affected based on experience of the respondents in years. A significant regression equation was established ($F(1,81)=116.6, p<0.01$), with an $R^2=0.59$. The respondents predicted number of percutaneous injuries is equal to $-0.135+ 0.154(\text{experience})$ percutaneous injuries when experience is measured in years.

The two leading circumstances associated with the Percutaneous injuries using the Multiple Response questionnaire items are needle recapping(26%, $n=154$) and Clearance after procedures. The Multiple Response summary of the circumstances associated with Percutaneous Injuries are presented in following figure 1.

Figure 1.

Circumstances of Sustaining Percutaneous Injuries



About a third (27.7%, $n=83$) of those afflicted by percutaneous injuries report to the hospital authorities for further management.

DISCUSSION

The majority of the respondents were of female gender (73%, n=145) and was youthful in age (36.6 years, SD=7.1) which is a reflection of the nursing profession composition in Kenya. This corroborates findings that the largest numbers of nursing workforce in Kenya are between 30 to 40 years¹⁰.

This study established that an overwhelming majority (87.6%, n=145) were knowledgeable on the Universal Precautions with mean knowledge score of 71%. Most studies on this subject¹¹⁻¹³, have previously reported that majority (over 75%) of health workers in general are knowledgeable in the subject of the Universal Precautions with mean scores of at least 65%. This implies that the Universal Precautions concept and the general infection prevention and control principles are highly valued, appreciated and emphasized in the nursing training institutions in Kenya as alluded by¹². The variance in knowledge mean scores of the two selected hospital is probably due to the individual hospital authorities effort in continuous professional education on the subject and the setting difference; Baringo County Referral Hospital had a better mean score (75%) is situated adjacent to a nursing training college thus it is in an academic environment compared to Nandi County Referral Hospital mean score (66.7%). Also in a study done in a University teaching Hospital in United Arab Emirates, the knowledge nurses was strikingly high at 97.0%¹³ giving the credence to the idea that respondents in academic settings tend to do well in knowledge scores. This study established that a minority (42.1%, n=145) of the respondents were compliant to the Universal Precautions based on the set criteria. The general mean compliance score was 4.2 (SD=1.3) out of the possible 8 points which translates to 52.5%. This compares slightly poorly than the Australian compliance with the Universal Precaution of 55.6%¹⁴ 69.4% of Brazil and 57.4% of Hong Kong¹⁵. Among our peers in the region we are slightly better as evidenced by a study done in Ethiopia which established a compliance rate of 42.9%¹⁶.

There was a significant linear relationship between to compliance with the Universal Precautions (UP) based on knowledge of the Universal Precautions on applying Linear Regression ($p < 0.01$) which tend to agree with many studies^{11,13,15} and disagree that the two are not related¹⁷ and my supposition is because the respondents were nursing students who often do well theoretical concepts and principles and exhibit minimal knowledge decay.

Participants predicted knowledge scores of UP is equal to $3.01 + 0.33(\text{age})$ scores when age is measured in years meaning the knowledge score of the Universal Precautions improves with increasing age. This contradict the finding that young health workers

had good practice compared to the older ones. This insinuates that people learn over time and precisely experiential learning¹⁶.

Slightly more than half (57.2%, n=145) of all the respondents have had ever had at least one percutaneous injuries but the specific prevalence per hospital favoured Baringo County Referral Hospital respondents (53.3%, n=75) compared to Nandi County Referral Hospital respondents had more injuries (61.4%, n=70). The prevalence of percutaneous injuries in East African is between 40-60%¹⁸⁻¹⁹, the local prevalence varies by hospital for instance in Kenyatta National Hospital recorded 44%²⁰, Moi Teaching and Referral Hospital recorded 43%¹⁸ and Nakuru County Referral Hospital recorded 44%²¹. The prevalence of percutaneous injuries in the two selected county hospitals was higher than previous recorded locally and this could be attributed to their locality that is these selected hospitals are by and large in rural setting compared to the other hospitals previously studied.

On employing Logistic Regression, it was established that the odds of getting afflicted with Percutaneous injuries is 47% higher in females than male respondents (OR=0.47, 95%CI= (0.22-0.99) is in concurrence with a similar²². I note that there is no difference in exposures to risks of percutaneous injuries by gender, however, this could be because male nurses are more calm in executing their clinical duties and the minority are likely to be allocated administrative duties.

Linear Regression established that a significant relationship exist between age and experience in service with the number of percutaneous injuries ($p < 0.01$), with the number of predicted percutaneous injuries increasing with both age and experience corresponding other studies²⁰. As one advances in age and increases the clinical experience (years of service), the period of time of exposure also increases thus the elderly and most experienced nurses are likely to have been afflicted than the young nurses. About a third (27.7%, n=83) of those afflicted by percutaneous injuries report to the hospital authorities for further management. This is comparable with what is documented that 30-60% of percutaneous injuries are unreported²³. This reluctance to report percutaneous injuries cases despite the overstated advantages points to some degree of stigma and apathy associated.

CONCLUSION AND RECOMENDATIONS

The study concluded that the level of knowledge of the Universal Precautions among the Registered Nurses is very good but is not corresponding to the relatively average compliance of the same Universal Precautions. It is worth noting that the

level of knowledge of the Universal Precautions was very significant with the compliance With the same Universal Precautions. Most of the Registered Nurses have ever encountered Percutaneous Injuries and most of the affected are reluctant to report to hospital authorities for further management. This study recommends that the health fraternity and policy-makers needs to consider other innovative approaches of encouraging compliance with the Universal Precautions and reporting of percutaneous injuries. Taking cognisant that usual conservative continuous professional education was not significant to either compliance with the Universal Precautions, percutaneous injuries incidences and the reporting of percutaneous injuries. These approaches could include but not limited to individual or small group approaches and geared towards changing the perceptions of the Registered Nurses towards the the Percutaneous Injuries and mitigating stigma associated with reporting of percutaneous injuries.

REFERENCES

1. NIOSH (2013) Stop Sticks Campaign: Center for Disease Control and Prevention. Atlanta; USA.
2. Royer, K. (2004) "Primer on Sharps Injuries" (Sharps Safety) Outpatient Magazine 5, No 50.
3. Falagas, M. E., Karydis, I. and Kostogiannou, I. (2007) Percutaneous exposure incidents of the health care personnel in a newly founded tertiary hospital: a prospective study. *PLoS ONE*. Feb 7; 2(2):e194.
4. Wilburn, S. Q. and Eijkemans, G. (2004) Preventing needlestick injuries among healthcare workers: a WHO-ICN collaboration (2000). *International Journal of Occupational and Environmental Health*. Oct-Dec;10(4):451-6.
5. Berry, S. and Noble, R. (2009) Understanding HIV/AIDS Statistics. Retrieved from <http://www.avert.org/arvs/.html> Accessed in May 2016.
6. WHO-ICN collaboration (2000). *International Journal of Occupational and Environmental Health*. Oct-Dec;10(4):451-6.
7. Prüss-Ustün, A., Rapiti, E. and Hutin, Y. (2003) Global burden of disease from sharps injuries to health-care workers. *Environmental Burden of Disease Series*, No. 3
8. Mukthar, V. K., Karani, A. K. and Kangethe, S. (2009) Percutaneous Injuries Among the Nurses: The Case of Rift Valley Provincial Hospital in Kenya. *Kenya Nursing Journal*. Dec. 38(2).
9. Maheshwari, S. and Muthamilselvi, G. 2014 "Assess the Effectiveness of Structured Teaching Program of the Universal Precaution Among Class IV Employees Working at Aarupadai Veedu Medical College and Hospital, Puducherry, India" *American Journal of Nursing Research*, Vol 2, No 2.
10. Riley, P. L., Vindigni, S. M., and Marum, L. H. (2007 June) Developing a Nursing Database in Kenya. *Health Service Research* Vol 42(3 Pt 2):1389-1405.
11. Oliveira, A. C., Marziale, M. H. P., Paiva, M. H. R. S. and Lopes, A. C. S. (2009 June) Knowledge and Attitude Regarding Standard Precaution in Brazilian Public Emergency Service: A Cross-sectional Study. *Revista da escola de Enfermagem da USP*. Vol 43, Issue 2.
12. Vaz, K., McGrowder, D., Alexander-Lindo, R., Gordon, L., Brown, P. and Irving, R. (2010 Oct) Knowledge, Awareness and Compliance with Universal Precautions Among Healthcare workers at the University Hospital of the West Indies, Jamaica. *International Journal of Occupational and Environmental Medicine*. Vol 1, Issue 4.
13. Sreedharan, J., Muttappillymyalil, J. and Venkatramana, M. (2011) Knowledge about Standard Precautions among University Hospital Nurses in the United Arab Emirates. *Eastern Mediterranean Health Journal*. Vol. 17, Issue 4.
14. Sonya, O., (2002) Compliance with Standard Precautions and Occupational Exposure Reporting Among Operating Room Nurses in Australia. Unpublished Masters by Research Thesis, University of Canberra.
15. Pereira, F. M. B., Lam, S. C., Chan, J. H. M. and Malaguti-Toffano, S. E. (2015 April) Difference in Compliance with Standard Precautions by Nursing Staff in Brazil versus Hong Kong. *American Journal of Infection Control*. Vol 3; Issue 2.
16. Gebresilassie, A., Kumei, A. and Yemane, D. (2014 May) Standard Precautions Practice among Health Care Workers in Public Health Facilities of Mekelle Special Zone, Northern Ethiopia. *Journal of Community Medicine & Health Education*. Vol 4.
17. Labrague, L. J., Rosales, R. A. and Tizon, M. M. (2012) *International Journal of Advanced Nursing Studies*. Vol. 1, Issue 2.
18. Makhokha, B. B., (2012) Prevalence of Accidental Exposures to Selected Blood Borne Pathogens and Utilization of Post-exposure Prophylaxis Among Health workers in Kenyan Hospitals. <http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/8958>.
19. Kaweti, G. and Abegaz, T. (2016 Jan) Prevalence of Percutaneous Injuries and Associated Factors Among Health Care Workers in Hawassa Referral and Adare District Hospitals, Hawassa, Ethiopia, *BMC Public Health*. Vol 16; Issue 8.
20. Wafula, K. S. (2012) Occupational Risk Factors Contributing to Injury by Medical Sharps Among Health Workers at Kenyatta National Hospital, Nairobi, Kenya. Unpublished Thesis.
21. Mukthar, V. K. (2010) Post-Exposure Prophylaxis use among Nurses: The Case of Rift Valley Provincial Hospital in Kenya. *Egerton Journal of Science and Technology*.; 10 (2073-8277).
22. Mbaisi, E. M., Nganga, Z., Wanzala, P. and Omolo, J. (2013 Jan) Prevalence and factors associated with percutaneous injuries and splash exposures among health-care workers in a provincial hospital, Kenya, 2010. *Pan African Medical Journal*. Vol 14; Issue 10.
23. Wilburn, S. Q., (2004). Needle and sharps injury prevention. *Online Journal of Issues in Nursing*. Vol. 89; Issue 3. Available from http://nursingworld.org/ojin/topic25/tpc25_4.htm.