

# Knowledge, awareness and practice regarding needle stick injuries in dental profession in India: A systematic review

Vinod Kapoor, Ramandeep Singh Gambhir<sup>1</sup>, Simarpreet Singh<sup>1</sup>, Sanjeet Gill<sup>2</sup>, Agiopal Singh<sup>1</sup>

Department of Oral Surgery, <sup>1</sup>Public Health Dentistry, <sup>2</sup>Periodontics, Gian Sagar Dental College and Hospital, Rajpura, Punjab, India

## ABSTRACT

**Background:** Hundreds of thousands of healthcare workers remain susceptible to deadly viruses throughout the year, including blood-borne pathogens. Needle stick injuries (NSI) constitute one of the most common occupational health hazards in healthcare profession. Dental professionals are at more risk of acquiring NSI due to their limited and restricted working area. The present systematic review was carried out to determine knowledge, awareness and practice regarding NSI in dental professionals and students in India. **Materials and Methods:** A systematic review of cross-sectional studies available in the literature on the knowledge, attitude and practice among dental professionals and students in India was carried out. We identified relevant articles through electronic and manual search such as Pubmed and MEDLINE. Two investigators independently identified studies that were included in the review. **Results:** Four articles were finally selected for inclusion in the review. All the studies were done involving dental students; 89.23% of the students had correct knowledge about NSI and 91.55% of the students had adequate level of awareness regarding its management in one of the studies. Also, 89% of students in one of the studies were aware of taking post-exposure prophylaxis after accidental NSI. In another study, 44% of the students destroyed the needles using a needle destroyer and 15% destroyed them in puncture-resistant containers. **Conclusion:** The knowledge and awareness of the dental students is adequate, although there is considerable variation in practice and management of NSI among different studies. There is a need for more studies involving dental professionals.

**Key words:** Awareness, dental students, injury, knowledge, needle stick, post-exposure prophylaxis, practice

### Address for correspondence:

Dr. Ramandeep Singh Gambhir,  
Gian Sagar Dental College,  
Rajpura - 140 601,  
Punjab, India.  
E-mail: raman1g@yahoo.co.in

## INTRODUCTION

Needle stick injuries (NSI) has always been one of the most important risk factor for healthcare workers (HCWs) for transmission of various infections such as hepatitis B, hepatitis C and human immunodeficiency virus (HIV).<sup>1</sup> As per the 2008-2009 HIV estimates, there are an estimated 23.9 lakh people currently living with HIV/AIDS in India with an adult prevalence of 0.31% in 2009.<sup>2</sup> Variety of procedures like needle recapping, injuries sustained

in the operating room, blood collection or intravenous line administration, suturing and checking blood sugar can lead to accidental NSI [Table 1].<sup>3,4</sup> The probability of transmission varies depending on whether the exposure is with a hollow-bore needle or a solid needle due to higher fluid content and pathogen load. Although modern dentistry has been cited as the least hazardous of the all the occupations, risks like NSI still challenge the status of this occupation.<sup>5</sup> Compared to many other healthcare settings, dental professionals are at higher risk of acquiring infections due to the fact that dentists work in a limited-access and restricted-visibility field and frequently use sharp devices.<sup>6</sup>

Every year, about 16 billion injections are administered in developing and transitional nations and approximately 3 million individuals are injured due to needle stick and sharp injuries.<sup>7</sup> These types of blood-borne exposures can be career and life-ending. There is gross under reporting of NSI and, therefore, the incidence of NSI is higher than

Access this article online	
Quick Response Code:	Website: <a href="http://www.nigeriamedj.com">www.nigeriamedj.com</a>
	DOI: 10.4103/0300-1652.126283

the current estimates.<sup>8</sup> According to recent estimates, approximately 10,00,000 HCWs in US and 1,00,000 HCWs in UK receive NSI from conventional needles and sharps every year.<sup>3</sup> It was also found that the use of glass syringe was constantly associated with higher degree of unsafety.<sup>9</sup> In developing countries like Ghana, Indonesia and Uganda, 80-90% of patients who visited a health centre received one or more injections per visit.<sup>10</sup> A positive correlation has been reported between the frequency of injections and the prevalence of blood-borne infections in the population. Another study reported a high incidence of needle stick and sharp injuries among HCWs in Jordan.<sup>11</sup> In South Africa, 91% of junior doctors reported sustaining a NSI in the previous year.<sup>12</sup> Results of another cross-sectional study conducted in Iran among medical and dental students showed that 74.3% had experienced NSIs, and the highest incidence among the dental students was seen in Endodontics, Surgery and Periodontics Departments.<sup>13</sup> According to another study conducted in a Dental Institute in London, it was found that oral surgery clinics were the major source of reporting of NSIs compared with other specialised dental clinics within the institute.<sup>14</sup>

In a country like India, in spite of large number of awareness programs, it is not possible to estimate the annual incidence of NSI in different occupations because of the scarcity of data.<sup>1</sup> Moreover, data regarding the prevalence of NSI in dental profession is almost non-existent in India as compared to that in other countries. As many dental professionals and students are not aware of the preventive and immediate prophylactic measures to be taken in case of such happenings,<sup>15,16</sup> the present systematic review was conducted:

- Reporting the knowledge and awareness of the dental health professionals (students) regarding transmission of infection through NSI.
- Reporting about the various practices employed by dental students such as methods to dispose the needles after use.
- Reporting on the post-exposure prophylaxis (PEP) taken by them in case of any accidental NSI.
- Comparing the level of awareness and injuries sustained among the undergraduate and postgraduate

dental students.

## MATERIALS AND METHODS

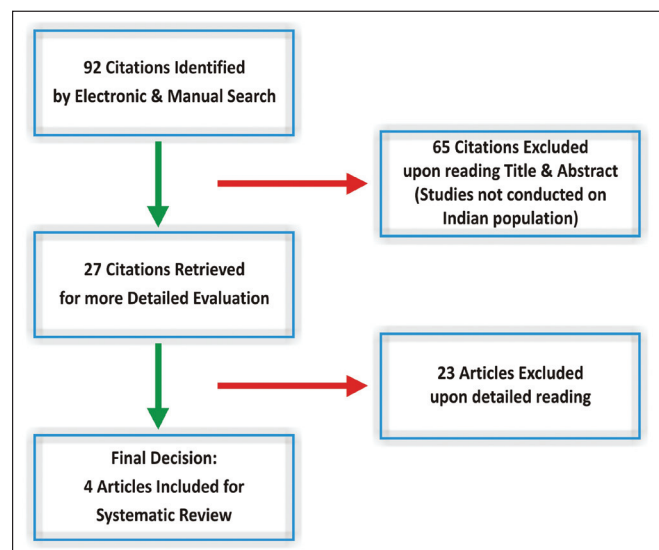
The present paper deals with the systematic review on NSI, but the authors have not attempted to conduct a thorough meta-analysis. Study selection was based on the following inclusion criteria: 1) Studies conducted in India; 2) subjects limited to dental HCWs in hospitals and dental colleges; 3) studies conducted on dental students; 4) studies published in English language; 5) studies evaluating the knowledge, awareness and practice regarding NSI as outcome measures; and 6) observational studies. No limitation in terms of publication date was considered in the search strategy.

The studies that were excluded from the present review were 1) studies not conducted in India; 2) reviews; 3) studies engaging medical HCWs; and 4) studies on all HCWs that did not differentiate between different healthcare professionals (dental, medical or any other). Initial electronic search for NSI in HCWs yielded 92 references and only four were retained. Full texts of all four articles were extracted by electronic and manual search from PGIMER Library and National Library.

The present review of literature was carried out both electrically as well as manually. Search strategy is depicted in Figure 1. The present review was carried out based on the protocol and guidelines for preparation from a previous study.<sup>17</sup> A comprehensive literature search of English articles using Pubmed, MEDLINE, EMBASE and Cochrane Library was carried out irrespective of the date of publication using the appropriate terms and key words. Various key words and their combination were used to build-up the search strategy [Table 2].

**Table 1: Various determinants of NSIs**

1.	Excessive of injections and unnecessary sharps.
2.	Lack of supplies: Disposable syringes, safer needle devices and sharps-disposal containers.
3.	Lack of access to and failure to use sharps containers immediately after injection.
4.	Inadequate or short staffing.
5.	Recapping needles after use.
6.	Lack of engineering controls such as safer needle devices.
7.	Passing instruments from hand to hand in the operatory.
8.	Lack of awareness and lack of training.



**Figure 1: Search strategy**

Experts and authors were also contacted for obtaining missing or unclear data whenever deemed essential. Articles were manually retrieved from PGIMER Library, Chandigarh and National Medical Library, New Delhi.

Two authors (VK and RSG) independently identified studies that were included in the present review. Initially, titles and abstracts of the records retrieved by the search were assessed in order to exclude those studies that were inappropriate. For the remaining studies, full-text articles were recovered that met the inclusion criteria. Selected studies were screened using STROBE checklist for observational studies.<sup>18</sup> The STROBE Statement is a checklist of items that should be addressed in articles reporting on the three main study designs of analytical epidemiology: Cohort, case-control and cross-sectional studies. These items relate to the article's title and abstract, the introduction, methods, results and discussion sections and other information. All the four studies fulfilled the requirements in the checklist.

**Table 2: Various key words and their combinations used**

1.	needlestick injuries
2.	dental profession
3.	India
4.	1 or 2 or 3
5.	dentistry
6.	post-exposure prophylaxis
7.	1, 3 and 5
8.	awareness
9.	knowledge
10.	practice
11.	1, 8 and 9 or 10
12.	1, 3, 5 and 8 or 6
13.	dental students
14.	1, 2 and 13 or 5

Two reviewers were assigned the job of identification of bias within individual studies. Following issues were included in the risk of bias or quality assessment in the present systematic review: (1) Completeness of reporting information regarding NSIs, (2) selective outcome reporting, (3) choice of outcome measures (knowledge or awareness levels, practices adopted and PEP measures), (4) study design and (5) conflict of interest in the conduct of the study. An overall estimation of plausible risk of bias (low, moderate or high) was performed for each of the selected studies. When all criteria were met, the risk of bias was estimated as low.

This review was done according to the guidelines set forth by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).<sup>19</sup> Two of the authors (SS and SG) were given the responsibility of extracting data from the studies. Pre-specified data was extracted from each of the studies, including the study design, sample size, prevalence of NSIs among the study subjects, awareness and knowledge regarding the NSIs occurring at the work place and other study characteristics. Any kind of disagreement regarding article screening and extraction was sorted out by the other author.

## RESULTS

The original search identified 92 potentially eligible citations, of which only four were finally included in the present review.<sup>20-23</sup> On screening by STROBE checklist, all the four studies fulfilled the requirements of reporting of observational studies. The study population in all the four studies comprised of dental students enrolled in various dental colleges of India [Table 3]. Two of the studies were conducted in the state of Maharashtra and one each was conducted in Karnataka and Andhra Pradesh. All the studies were cross-sectional in nature and used a closed- or

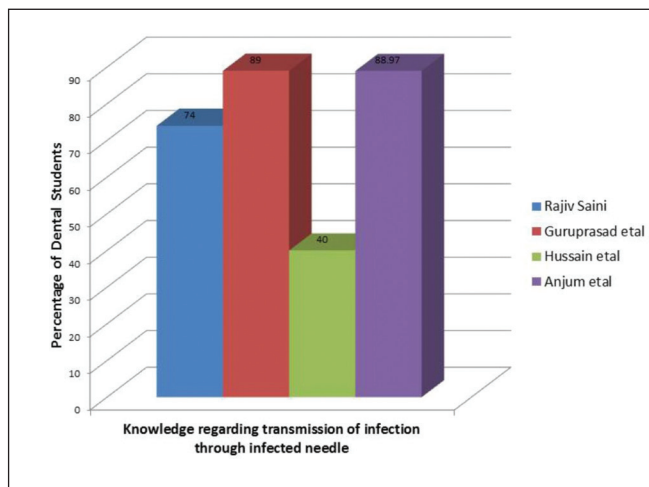
**Table 3: Various study characteristics on needle stick injuries included in the review**

Authors	Year of publication	Study population	Sample size	Study design	Study area	Outcome measure	Results
Rajiv Saini <sup>20</sup>	2011	Dental students	150	Questionnaire based cross-sectional study	Maharashtra	Knowledge and awareness level	89.23% had correct knowledge about NSI, 91.55% exhibited adequate awareness level regarding management of NSI
Guruprasad <i>et al</i> <sup>21</sup>	2011	Dental students	120	Semi-open self-administered questionnaire based cross-sectional study	Karnataka	Knowledge, attitude and practice	11% were not aware about virus transmission through NSI, 22.5% were not aware of correct method to dispose needles
Hussain <i>et al</i> <sup>22</sup>	2012	Dental, Medical and Nursing Students	306	Questionnaire based cross-sectional study	Maharashtra	Prevalence and factors associated with sharp instrument injuries	75.4% of dental students experienced sharp injuries during 1 year, 52.3% occurred during LA administration
Anjum <i>et al</i> <sup>23</sup>	2012	Dental Students	281	Close-ended questionnaire based cross-sectional study	Andhra Pradesh	Awareness and prevalence of accidental blood borne exposures	Blood-borne exposures were 88.9%. In 49%, syringe needle was the most common instrument

open-ended questionnaire for gathering the relevant data on NSIs from the subjects.

Knowledge and awareness level of dental students regarding NSI was the main outcome in the study conducted by Rajiv Saini,<sup>20</sup> whereas Guruprasad *et al.*,<sup>21</sup> assessed the knowledge, attitude and practice regarding risk of human immunodeficiency virus (HIV) transmission through NSI among dental students. Hussain *et al.*,<sup>22</sup> determined the prevalence and factors associated with sharp instrument injuries among different healthcare students (dental, medical and nursing). Awareness and prevalence of accidental blood-borne exposures among undergraduate and postgraduate dental students was the main outcome in the study done by Anjum *et al.*<sup>23</sup>

On an average, 89.23% of the students had correct knowledge about NSI and 91.55% of the students had adequate level of awareness regarding its management in one of the studies ( $P < 0.05$ ).<sup>20</sup> Figure 2 depicts the knowledge regarding transmission of infection through infected needle among students in different studies. Guruprasad *et al.*,<sup>21</sup> reported in their study that 89% of the students were aware of the fact that the virus could be transmitted through infected needles and among the students who were unaware, 22.5% were third year students. Only 39.8% of the healthcare students could correctly define sharp instrument injury in the study conducted by Hussain *et al.*,<sup>22</sup> (did not specify the field of healthcare for this particular question). According to another study reports, 88% of the dental students were aware of the occupational blood-borne diseases ( $P < 0.05$ ),<sup>23</sup> 33% of the respondents were aware about Universal Precaution Guidelines that was found to be statistically significant among postgraduate dental students ( $P = 0.00$ ). Postgraduate students had more awareness as compared to undergraduate students.<sup>23</sup>



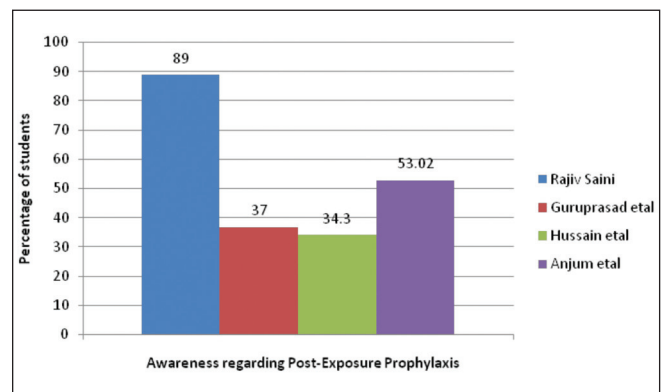
**Figure 2:** Knowledge regarding transmission of infection through infected needle among dental students

Guruprasad *et al.*,<sup>21</sup> reported on the practice of needle destruction after use and found that 44% of the students destroyed the needle using needle destroyer and 15% destroyed them in puncture-resistant container with disinfectant. When enquiring about PEP, 26% reported washing the site of injury with surgical spirit and the same number of students said that they promote active bleeding at the site of injury. Only 12% were in favour of washing the wound with soap and running water. Maximum numbers of students (89%) in the study conducted by Saini<sup>20</sup> were aware of taking PEP after an accidental NSI as compared to other studies [Figure 3]. Hussain *et al.*,<sup>22</sup> reported 2.3% of the sharp instrument injuries occurred during administration of local anaesthetic injection ( $P < 0.05$ ). In the study conducted by Anjum *et al.*,<sup>23</sup> majority of the accidents (56%) were reported while performing injections and were found to be more among third year students ( $P = 0.02$ ).

## DISCUSSION

The results in the present systematic review have been prepared and discussed regarding NSI among dental students in India. The present review shows that the knowledge and awareness level of dental students regarding NSI is adequate, which is evident from different studies, although there is considerable inadequacy and variation in the practice and management of NSI among dental students. The knowledge and awareness level varies in different studies, which can be attributed to the difference in sample size and different study settings. There was only one study that involved postgraduate dental students as compared to rest of the studies, which targeted only undergraduate students and interns.<sup>23</sup> All the studies used a closed- or open-ended questionnaire for gathering information about NSI from the dental students.

In comparison with different groups, it was reported in one of the studies that postgraduate students had good awareness, but alarmingly they also reported higher



**Figure 3:** Awareness regarding post-exposure prophylaxis among dental students

number of injuries.<sup>23</sup> This could be due to the fact that postgraduate students have more clinical load as compared to the undergraduate students and thus are generally at higher risk of such hazards.<sup>14</sup> Only 31% of the third year dental students were in favour of washing the wound with soap and running water after accidental injury in one study<sup>21</sup> as compared to 80% in another study reports.<sup>20</sup>

Different statistical tools were used in the studies to assess knowledge and awareness regarding NSI among dental students. One of the studies used Z test and standard deviation,<sup>20</sup> while three of the studies employed Chi-square test for associations between different attributes.<sup>21-23</sup> Statistical significance was set to  $P < 0.05$  to compare knowledge, awareness and practice in all the studies.

Two of the studies did not mention the year of the study course in which the students were enrolled, as this can have a significant impact on the knowledge and awareness level of the students and may be a source of potential bias when the results are interpreted.<sup>20,22</sup> A self-reported questionnaire was used for gathering information from the students regarding NSI. This can increase the risk of bias while evaluating studies on knowledge and awareness.

There are few limitations of this study. It was based on a review of earlier studies that were conducted in different time periods by different authors. Therefore, the generalizability may be inaccurate, although the studies were screened using STROBE checklist for observational studies. All the studies included in the present review were conducted on dental students in India. Studies conducted on knowledge and awareness levels of dentists or other dental professionals like dental assistants and dental nurses were almost non-existent. These personnel are in immediate contact with diverse patients on a daily basis and consequently are prone to more risk. The questions that were formulated to extract information regarding NSIs from the study participants in all the studies were diverse; therefore, it was difficult to compare the results of the selected studies and common findings were reported. Furthermore, attempts were made to include all the published literature on the knowledge, awareness and practice of NSI in dental profession, but it is possible that some relevant data may have overlooked in terms of fugitive literature (e.g., conference proceedings, dissertations) and important information will undoubtedly be overlooked with the type of literature search strategy used to conduct the present review.

## CONCLUSION AND RECOMMENDATIONS

The knowledge and awareness of the dental students in the present review is adequate, although there is considerable variation in the practice and management of NSI among

different studies. Not every NSI can be preventable, but, according to a research, 83% of injuries from hollow bore needles can be prevented.<sup>24</sup> The present review also concludes that, for prevention of NSI, knowledge and awareness among dental HCWs should be increased. More studies should be conducted involving dentists and other dental professionals, as there is scarcity of literature on knowledge and awareness levels of dentists in India. Various health and safety measures can be adopted to decrease the incidence of NSI, as follows:

- Workers should be properly trained
- Personal protective equipment and clothing should be provided
- An effective occupational health and safety program should be established that includes immunization, PEP, medical and dental surveillance

## REFERENCES

1. Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G. Needle stick injuries in a tertiary care hospital. *Indian J Med Microbiol* 2009;27:44-7.
2. Department of AIDS Control. Ministry of Health and Family Welfare, India. Annual Report. New Delhi; 2012. Available from: [http://www.aidsdatahub.org/dmdocuments/NACO\\_Annual\\_Report\\_2011\\_12.pdf](http://www.aidsdatahub.org/dmdocuments/NACO_Annual_Report_2011_12.pdf) [Last cited on 2013 May 27].
3. Muralidhar S, Singh PK, Jain RK, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian J Med Res* 2010;131:405-10.
4. Wilburn SQ, Eijkemans G. Preventing needlestick injuries among healthcare workers: A WHO-ICN collaboration. *Int J Occup Environ Health* 2004;10:451-6.
5. Ayatollahi J, Ayatollahi F, Ardekani AM, Bahrololoomi R, Ayatollahi J, Ayatollahi A *et al.* Occupational hazards to dental staff. *Dent Res J (Isfahan)* 2012;9:2-7.
6. Younai FS, Murphy DC, Kotelchuck D. Occupational exposures to blood in a dental teaching environment: Results of a ten-year surveillance study. *J Dent Educ* 2001;65:436-48.
7. World Health Organisation. Injection safety. Geneva: World Health Organisation; 2002. Available from: <http://www.who.int/mediacentre/factsheets/fs231/en> [Last cited on 2013 Mar 30]
8. Au E, Gossage JA, Bailey SR. The reporting of needlestick injuries sustained in theatre by surgeons: Are we under-reporting? *J Hosp Infect* 2008;70:66-70.
9. Kermode M, Muani V. Injection practices in the formal and informal healthcare sectors in rural north India. *Indian J Med Res* 2006;124:513-20.
10. Sagoe-Moses C, Pearson RD, Perry J, Jagger J. Risks to health care workers in developing countries. *N Engl J Med* 2001;345:538-41.
11. Khuri-Bulos NA, Toukan A, Mahafzah A, Al Adham M, Faori I, Abu Khader I, *et al.* Epidemiology of needlestick and sharp injuries at a university hospital in a developing country: A 3-year prospective study at the Jordan University Hospital, 1993 through 1995. *Am J Infect Control* 1997;25:322-9.
12. Rabbits JA. Occupational exposure to blood in medical students. *S Afr Med J* 2003;93:8.
13. Hashemipour M, Sadeghi A. Needle stick injuries among medical and dental students at the University of Kerman. A questionnaire study. *J Dent (Tehran)* 2008;5:71-6.
14. Gaballah K, Warbuton D, Sihmbly K, Renton T. Needle stick injuries among dental students: Risk factors and recommendations for prevention. *Libyan J Med* 2012;7.

15. Callan RS, Caughman F, Budd ML. Injury reports in a dental school: A two-year overview. *J Dent Educ* 2006;70: 1089-97.
16. Kotelchuck D, Murphy D, Younail F. Impact of under reporting on the management of occupational bloodborne exposures in a dental teaching environment. *J Dent Educ* 2004;68;614-22.
17. Centre for Reviews and Dissemination. Systematic reviews: CRD's guidance for undertaking reviews in health care. York: University of York, 2009. Available from: [http://www.york.ac.uk/inst/crd/systematic\\_reviews\\_book.htm](http://www.york.ac.uk/inst/crd/systematic_reviews_book.htm). [Last cited on 2013 May 15].
18. STROBE Statement. Strengthening the reporting of observational studies in epidemiology. Switzerland; 2007. Available from: <http://www.strobe-statement.org/index.php?id=available-checklists>. [Last cited on 2013 Mar 30].
19. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, *et al.* The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions. Explanation and elaboration. *J Clin Epidemiol* 2009;62:e1-34.
20. Saini R. Knowledge and awareness of needlestick injury among students of Rural Dental College, Maharashtra, India. *Ann Niger Med* 2011;5:12-4.
21. Guruprasad Y, Chauhan DS. Knowledge, attitude and practice regarding risk of HIV infection through accidental needlestick injuries among dental students of Raichur, India. *Natl J Maxillofac Surg* 2011;2:152-5.
22. Hussain JS, Ram SM, Galinde J, Jingade RR. Occupational exposure to sharp instrument injuries among dental, medical and nursing students in Mahatma Gandhi Mission's Campus, Navi Mumbai, India. *J Contemp Dent* 2012;2:1-10.
23. Anjum MS, Bhanu RK, Reddy PP, Sudhakar V, Monica M, Rao KY. Awareness and prevalence of accidental blood-borne exposures among students of Sri Sai College of Dental Surgery Vikarabad. *J Oral Health Community Dent* 2012;6:47-51.
24. Jahan S. Epidemiology of needlestick injuries among health care workers in a secondary care hospital in Saudi Arabia. *Ann Saudi Med* 2005;25:233-8.

**How to cite this article:** Kapoor V, Gambhir RS, Singh S, Gill S, Singh A. Knowledge, awareness and practice regarding needle stick injuries in dental profession in India: A systematic review. *Niger Med J* 2013;54:365-70.

**Source of Support:** Nil, **Conflict of Interest:** None declared.