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Burden of Occupational Exposure to Sharp Injuries among Nurses Working in Public Hospitals in South Gondar Zone, Northcentral Ethiopia: Multi-center cross-sectional study

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3 1 **Burden of Occupational Exposure to Sharp Injuries among Nurses Working in**
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5 2 **Public Hospitals in South Gondar Zone, Northcentral Ethiopia: Multi-center cross-**
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7 **sectional study**
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19 Abstract

20 **Background:** Sharp injuries are the most common and preventable occupational
21 hazards that health care workers are exposed to the transmission of a variety of blood
22 borne infections such as HBV, HCV, and HIV/AIDS. Most of these sharp injuries (90%)
23 occur in developing countries, where the burden of blood borne infections in the general
24 population is high and access to safety devices and personal protective equipments is
25 limited. However, there is limited information in the study area that describes the burden
26 of occupational exposure to sharp injuries and its predictors among nurses.

27 **Objective:** This study aimed to assess the burden of occupational exposure to sharp
28 injuries and its predictors among nurses working in public hospitals in south Gondar.

29 **Method:** A multi-center cross-sectional study design was conducted among nurses
30 from November 01-30/2022. A total of 376 nurses working in all public hospitals were
31 included in the study. The collected data were checked for completeness, cleaned,
32 coded manually, and entered into Epi-Data version 4.2; then, exported to Stata version
33 14 for analysis. Variables with a p-value of <0.05 at 95% CI were considered
34 significantly associated with the outcome variable.

35 **Results:** Of the total respondents, 213 (56.65%) were between the age of 25-34 with
36 the mean \pm SD of age 30.22 \pm 6.63 years. Similarly, 202 (53.72%) of the respondents
37 were females. This study finding showed that the burden of occupational exposure to
38 sharp injuries among nurses was 52.39% (95%CI: 47.92%, 56.37%).

39 **Conclusions:** Generally, this study finding reported that the burden of occupational
40 exposure to sharp injuries among nurses was high. This study finding also showed that
41 years of service, infection prevention training, job related stress, and the presence of

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3 42 contaminated sharps at workplace were independent predictors of occupational
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5 43 exposure to sharp injuries among nurses.
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7
8 44 **Keywords:** Occupational exposure to sharp injuries, nurses, and public hospitals.
9

10 45 **Background**

11
12 46 A sharp injury is defined as "an accidental penetrating wound with an instrument that is
13
14 47 potentially contaminated with the body fluid of another person. And, sharp injuries occur
15
16 48 when health care providers perform their clinical activities in the health care facilities,
17
18 49 such as hospitals, health centers and clinics"[1]. The majority of sharp injuries occur
19
20 50 during administering injections, securing IV lines, drawing blood, checking blood sugar
21
22 51 ,recapping needles, poor handling and disposing of needles, and transferring blood or
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24 52 body fluids from a syringe to a specimen container [2].
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29 53 Globally, of the total of 35 million health care providers, it is estimated that 3 million
30
31 54 experience sharp injuries every year; of these, nurses are at the greatest risk, with up to
32
33 55 50% of all sharp injuries being sustained by nurses [3]. Because nurses have the
34
35 56 highest rate of encountering sharp injuries among health care providers due to their
36
37 57 prolonged exposure to needles and other sharp devices [4]. The European Biosafety
38
39 58 Network (EBN) reported that one million sharp injuries occur in European countries
40
41 59 annually [5].
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45 60 Most of these sharp injuries (90%) occur in developing countries, where the burden of
46
47 61 blood borne infections in the general population is high and access to safety devices
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49 62 and personal protective equipments (PPEs) is limited, specifically more common in sub-
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51 63 Saharan African countries. On average, health care providers in Africa suffer 2 to 4
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53 64 sharp injuries every year [6]. In Sub-Saharan Africa, the burden of sharp injuries and
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3 65 their predictors are not clearly understood among health care providers [7]. In Ethiopia,
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5 66 a study conducted in Jimma University Specialized Teaching Hospital(JUSTH) reported
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7 67 that the burden of occupational exposure to sharp injuries among nurses was 61.76%
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9
10 68 [1, 8]. Sharp injuries are markedly the most common and preventable occupational
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12 69 hazards that health care providers are exposed to and become high risk for the
13
14 70 transmission of a variety of blood borne infections such as hepatitis B virus(HBV),
15
16 71 hepatitis C virus(HCV), and human immunodeficiency virus (AIDS) [3, 9].

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18
19 72 Blood-borne infections following sharp injuries have serious consequences, including
20
21 73 long-term illness, psychological stress to the victims ,colleagues and family, disability
22
23
24 74 and death [10]. In addition to the potential risks for infectious diseases, they also suffer
25
26 75 for direct costs required for laboratory tests, including tests for HIV antibodies, hepatitis
27
28 76 B serology, and a baseline test for hepatitis C, as well as any treatments for these
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30
31 77 infections [11]. The implementation of education, universal precautions, elimination of
32
33 78 needle recapping, and use of sharp containers for safe disposal have reduced the
34
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36 79 chance of getting sharp injuries by 80% [12]. Health care providers who followed
37
38 80 universal precautions were 66% less likely to have needle sticks and sharp injuries than
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41 81 those who did not follow [13].

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43 82 Training of handling objects, using instruments to grasp needles, reduction of the use of
44
45 83 sharp devices, avoiding hand-to-hand passing of sharp instruments, decreasing of
46
47 84 direct contact with needles, an appropriate disposal and using safety boxes properly
48
49 85 can decrease the risk of getting sharp injuries [5].

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51
52 86 In Ethiopia, where primary health care services are covered by nurses, it is important to
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54 87 develop their knowledge and practice on universal precautions since the risks of getting

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3 88 infections following sharp injuries are high in their day to day activities [8]. However,
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5 89 there is limited information in the study area that describes the burden of sharp injuries
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8 90 and its predictors among nurses. Therefore, this study aimed to determine the burden of
9
10 91 occupational exposure to sharp injuries and its predictors.

92 **General objective**

93 To assess the burden of occupational exposure to sharp injuries among nurses working
94 in public hospitals in south Gondar zone, Northcentral Ethiopia, 2022

95 **Specific objectives**

- 96 ◆ To determine the burden of occupational exposure to sharp injuries among nurses
97 working in public hospitals in south Gondar zone, Northcentral Ethiopia, 2022
98 ◆ To identify the predictors of occupational exposure to sharp injuries among nurses
99 working in public hospitals in south Gondar zone, Northcentral Ethiopia, 2022

100 **Methods**

101 **Study design, area, and Period**

102 Multi-center cross-sectional study design was conducted among nurses working in
103 public hospitals in south Gondar zone from November 01-30, 2022.

104 **Study Population**

105 All nurses working in all public hospitals in south Gondar zone.

106 **Inclusion and exclusion criteria**

107 All nurses working in all public hospitals in south Gondar zone at the time of the data
108 collection period were included in the study; whereas, nurses who were on sick leave,
109 maternity leave, annual leave, and training at the time of data collection period were
110 also excluded from the study.

111 **Sample size determination, and sampling procedure/technique**

112 The sample size (n) was calculated by Computer-based Epi info7 software using a
 113 single population proportion at 95% CI, with a 5% margin of error, and by assuming the
 114 burden of occupational exposure to sharp injuries among nurses to be 61.76% [1].

$$n = \frac{(Z\alpha/2)^2 P (1-P)}{d^2}$$

117 *Where:* - n= the minimum sample size required for the study

118 Z= standard normal distribution (Z=1.96) with a 95% confidence interval

119 P= burden of occupational exposure to sharp injuries among nurses

120 (61.76%=0.6176)

121 d= is a tolerable margin of error (d=5%=0.05)

$$n = \frac{(1.96)^2 0.6176(1-0.6176)}{(0.05)^2}$$

124 n=363. Then, by adding a 10% (0.1) non-response rate, the final sample size
 125 (n) was calculated to be 400. But, since it was the minimum sample size required, and
 126 the source population was only 402, the source population (402) was taken as a sample
 127 size for this study.

128 **Dependent Variable**

129 Occupational exposure to sharp injuries

130 **Independent variables**

- 131 ■ Socio-demographic characteristics: Age, sex, marital status, level of education, and
 132 years of service.
- 133 ■ Behavioral characteristics: Sleeping disturbance, following of standard precaution
 134 guide line, use of PPE, knowledge of standard precautions, and job-related stress.

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3 135 ▪ Work environment characteristics: Length of stay/shift, health and safety information
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5 136 access, infection prevention training, work load, availability of safety box, availability
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7 137 of standard precaution guidelines, and presence of contaminated sharps.
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10 138 **Operational Definitions**

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12
13 139 **Occupational exposure to sharp injuries:** Any kind of sharp injury which occurred
14
15 140 among nurses in relation to his/her job in the health care facility [14].
16

17 141 **Knowledge:** Nurses who have scored $\geq 75\%$ (9) of 12 knowledge related questions
18
19 142 were considered to have adequate knowledge; whereas, nurses who have scored
20
21 143 below 75% were also considered to have inadequate knowledge towards sharp injuries
22
23 144 [15].
24
25

26 145 **Job Stress:** Nurses who scored above or equal to the mean score (32.78) of the Likert-
27
28 146 scale questions that used to assess nurses' job-related stress were considered they
29
30 147 have a job related stress, whereas, nurses who scored below the mean score were also
31
32 148 considered they didn't have job-related stress [14].
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36 149 **Data collection tool and procedure**

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38 150 A structured and pre-tested self-administered English version questionnaire was used to
39
40 151 collect the data. The questionnaire was prepared by reviewing different literatures and
41
42 152 using standardized Likert-scale questions to assess job-related stress of the
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44 153 respondents, which were adopted from the Expanded Nursing Stress Scale (ENSS) [1,
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46 154 8, 14].
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50 155 The questionnaire contains nurses' socio-demographic, behavioral, environmental
51
52 156 characteristics, knowledge questions related to standard precaution and standardized
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54 157 Likert-scale questions to assess job-related stress of the respondents. Reliability of the
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3 158 tool was established with an overall Cronbach's alpha score (0.74 for knowledge
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5 159 questions related to standard precaution, and 0.79 for job stress Likert-scale questions.
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7 160 Before data collection, training was given to the data collectors. Before giving the
8
9 161 questionnaire, the data collectors informed the nurses about the aims/purposes, risks
10
11 162 and possible benefits of the study, the right and refusal to participate in the study and
12
13 163 that the collected information would be kept confidential.
14
15 164 After all, those nurses who were willing and have signed the informed voluntary consent
16
17 165 form were requested to fill out the questionnaire. The data collection was held for four
18
19 166 consecutive weeks (from November 01-30/2022).
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24 167 **Data quality control, processing, and analysis**

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26 168 Five percent of the questionnaire was pre-tested in Koladiba primary hospital to assess
27
28 169 the reliability, clarity, sequence, consistency, understandability and the total time that it
29
30 170 will take to finish the questionnaire before the actual data collection. Then, the
31
32 171 necessary comments and feedback were incorporated into the final tool to improve its
33
34 172 quality. Training was given data collectors regarding the objective of the study, data
35
36 173 collection tools, methods of data collection, checking the completeness of the collected
37
38 174 data, and how to maintain confidentiality.
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42 175 The collected data were checked for completeness, cleaned, edited, coded manually
43
44 176 and entered into Epi data version 4.2. A double data entry was done for its validity and
45
46 177 compared to the original data. Outliers were also checked & simple frequencies and
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48 178 cross tabulation were done for missing values and variables. Then, the data was
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50 179 exported to Stata version 14 for analysis. Descriptive analysis was done by computing
51
52 180 proportions and summary statistics. Then, the information was presented using simple
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3 181 frequencies, summary measures, tables and figures. Binary logistic regression was
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5 182 used to identify predictors of sharp injuries. Bivariate and multivariate analyses were
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7 183 used to see the association between the outcome variable and each independent
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10 184 variable.

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12 185 The assumptions for binary logistic regression were checked. The goodness of fit was
13
14 186 tested by Hosmer-Lemeshow statistics and Omnibus tests. All variables with $P < 0.2$ in
15
16 187 the bivariate analysis were included in the final model of multivariate analysis in order to
17
18 188 control all the possible confounders and the variables were selected by using enter
19
20 189 method. The adjusted odds ratio (AOR) along with a 95% CI was estimated to identify
21
22 190 the predictors of occupational exposure to sharp injuries. In this study, variables with a
23
24 191 P-value < 0.05 were considered significantly associated with occupational exposure to
25
26 192 sharp injuries.

30 193 **Ethical Considerations**

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33 194 Ethical clearance was obtained from Debre Tabor University, College of Health
34
35 195 Sciences, ethical review board. All the respondents were informed about the purpose of
36
37 196 the study, their right to refuse and written and signed voluntary consent was obtained
38
39 197 from all the respondents prior to data collection. The respondents were told that the
40
41 198 information obtained from them would be treated with complete confidentiality and
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43 199 would not cause any harm to them.

46 200 **Result**

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49 201 Of the total of 402 respondents, 376 were included in the final analysis, giving a
50
51 202 response rate of 93.53%.

54 203 **Socio-demographic and working environment related attributes**

204 Of the total respondents, 213 (56.65%) were between the age of 25-34 with the mean \pm
 205 SD of age 30.22 ± 6.63 years. Similarly, 202 (53.72%) of the respondents were females.
 206 Additionally, only 89 (23.67%) of the respondents got infection prevention training.
 207 Moreover, 271 (72.07%) of them had safety boxes at workplace to dispose needles and
 208 other sharp materials after use, and 214 (56.91%) of respondents also stated that there
 209 were contaminated needles and sharp materials at workplace (Table 1).

210 Table1: Socio-demographic characteristics of the respondents working in public
 211 hospitals in south Gondar zone, Northcentral Ethiopia, 2022 (n=376).

Variables	Category	Frequency	Percentage (%)
Age	≤ 24	68	18.09
	25-34	213	56.65
	35-44	71	18.88
	≥ 45	24	6.38
Sex	Male	174	46.28
	Female	202	53.72
Marital status	Single	171	45.48
	Married	183	48.67
	Divorced	17	4.52
	Widowed	5	1.33
Educational level	Diploma	132	35.11
	BSc	244	64.89
Years of service	<5	136	36.17
	5-10	128	34.04
	>10	112	29.79
Sleeping disturbance problem	Yes	274	72.87
	No	102	27.13
Use of PPEs	All of the time	185	49.20
	Most of the time	102	27.13
	Sometimes	73	19.41
	Never use	16	4.26
Work load in the unit	Yes	212	56.38
	No	164	43.62
Length of stay/shift at work	≤ 8 hours	193	51.33

	9-14 hours	35	9.31
	≥15 hours	148	39.36
Health and safety information access	Yes	291	77.39
	No	85	22.61
Training on IP	Yes	89	23.67
	No	287	76.33
Availab. of safety box at work place	Yes	271	72.07
	No	105	27.93
Availab. of universal precaution guide line	Yes	212	56.38
	No	164	43.62
Following universal precaution guide line	Yes	93	43.87
	No	119	56.13
Presence of contaminated sharps at workplace	Yes	214	56.91
	No	162	43.09
Knowledge of standard precaution	Adequate knowledge	134	35.64
	Inadequate knowledge	242	64.36
Job related stress	Stressed	237	63.03
	Not stressed	139	36.97

212 *BSc, Bachelor of Science; *IP, infection prevention

213 **Burden of occupational exposure to sharp injuries**

214 This study finding showed that the burden of occupational exposure to sharp injuries
215 among nurses was 52.39% (95%CI: 47.92%, 56.37%) (197).

216 The occurrence of occupational exposure to sharp injuries was the highest among
217 respondents with the age of 45 years and above (62.50). Likewise, the majority of
218 males, 108(62.07) also got occupational exposure to sharp injuries. Occupational
219 exposure to sharp injuries was also the highest among diploma nurses, and nurses
220 having more than 10 years of service (59.85% and 62.50%) respectively. Moreover, the
221 occurrence of sharp injuries was also the highest among nurses working along with the
222 presence of contaminated sharps at workplace (Table 2).

223 Table 2: Distribution of sharp injuries among nurses working in public hospitals in south
 224 Gondar zone, Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Occupational exposure to sharp injuries	
		Yes (%)	No (%)
Age	≤24	32(47.06)	36(52.94)
	25-34	111(52.11)	102(47.89)
	35-44	39(54.93)	32(45.07)
	≥45	15(62.50)	9(37.50)
Sex	Male	108(62.07)	66(37.93)
	Female	89(44.06)	113(55.94)
Marital status	Single	87(50.88)	84(49.12)
	Married	96(52.46)	87(47.54)
	Divorced	11(64.71)	6(32.29)
	Widowed	3(60.0)	2(40.0)
Educational level	Diploma	79(59.85)	53(40.15)
	BSc	118(48.36)	126(51.64)
Year of service	<5	59(43.38)	77(56.62)
	5-10	68(53.13)	60(46.87)
	>10	70(62.50)	42(37.50)
Sleeping disturbance problem	Yes	141(51.46)	133(48.54)
	No	56(54.90)	46(45.10)
Use of PPEs	All of the time	89(48.11)	96(51.89)
	Most of the time	56(54.90)	46(45.10)
	Sometimes	41(56.16)	32(43.84)
	Never use	11(58.75)	5(31.25)
Work load	Yes	125(58.96)	87(41.04)
	No	72(43.90)	92(56.10)
Length of stay/shift at work	≤8 hours	95(49.22)	98(50.78)
	9-14 hours	19(54.29)	16(45.71)
	≥15 hours	83(56.08)	65(43.92)
Health & safety information access	Yes	148(50.86)	143(49.14)
	No	49(57.65)	36(42.35)
Training on IP	Yes	38(42.70)	51(57.30)
	No	159(55.40)	128(44.60)
Availab. of safety box	Yes	129(47.60)	142(52.40)
	No	68(64.76)	37(35.24)
Availab. of universal	Yes	99(46.70)	113(53.30)

precaution guide line	No	98(59.76)	66(40.24)
Following universal precaution guide line	Yes	42 (45.16)	51(54.84)
	No	155 (54.77)	128 (45.23)
Presence of contaminated sharps at workplace	Yes	136(63.55)	78(36.45)
	No	61(37.65)	101(62.35)
Knowledge of standard precaution	Adequate knowledge	59(44.03)	75(55.97)
	Inadequate knowledge	138(57.02)	104(42.98)
Job related stress	Stressed	149(62.87)	88(37.13)
	Not stressed	48(34.53)	91(65.47)

225 *BSc, Bachelor of Science; PPEs, personal protective equipments; and *IP, infection
226 prevention

227 Occupational exposure to sharp injuries related Attributes

228 Of the respondents who encountered occupational exposure to sharp injuries,
229 114(57.87%) had encountered sharp injuries 1-2 times. Additionally, 69 (35.03%) of
230 injuries occurred during abrupt movement of patients, and 86(43.65%) sharp injuries
231 were slight skin penetration. Moreover, 93 (47.21%) of injuries were from the unknown
232 status, and only 92 (46.70%) sharp injuries were reported to the concerned body (Table
233 3).

234 Table 3: Occupational exposure to sharp injuries related attributes among nurses
235 working in public hospitals in south Gondar zone, Northcentral Ethiopia, 2022 (n=376).

Variables	Values	Frequency	Percentage (%)
Frequency of injuries occurred	1-2 times	114	57.87
	3-4 times	71	36.04
	≥5 times	12	6.09
Condition of sharps	Dirty needles/sharps	74	37.56
	Sterile needles/sharps	58	29.45
	Both dirty & sterile needles/sharps	65	32.99
How sustaining injuries	During abrupt movement	69	35.03

	of patients		
	During recapping needle after use	63	31.98
	During sharp collection	46	23.35
	Others	19	9.64
Type of injuries sustained	Deep injury	54	27.41
	Slight skin penetration	86	43.65
	Superficial injury	57	28.94
Health status of the source patients	Known HIV/AIDS positive	37	18.78
	Clinically suspected HIV/AIDS	40	20.30
	Clinically diagnosed hepatitis B patient	27	13.17
	Unknown status	93	47.21
Report of the injuries	Yes	92	46.70
	No	105	53.30

236 *HIV/AIDS, Human immune deficiency virus/Acquired immune deficiency syndrome

237 **Distribution of sharp injuries by their type**

238 The major types of sharps that cause injuries to nurses were intravenous needles,
 239 64(32.49%), intramuscular needles, 42(21.32%) and suturing needles, 36(18.27%)
 240 (Figure1).

241 **Association between independent variables and occupational 242 exposure to sharp injuries**

243 Nurses having above 10 years of service were 2.35 times more likely to encounter
 244 occupational exposure to sharp injuries than nurses having less than 5 years of service
 245 ((AOR= 2.35, 95%CI: 1.21,4.57). On the other hand, nurses who got infection
 246 prevention training were 46% less likely to encounter occupational exposure to sharp
 247 injuries (AOR=0.54, 95%CI: 0.29,0.92). Additionally, nurses having job related stress
 248 were also 2.24 times more likely to be exposed for sharp injuries (AOR=2.24, 95%CI:
 249 1.27, 3.89), and nurses who were working in the area with the presence of

250 contaminated sharps were 2.76 times more likely to get the chance of occupational
 251 exposure to sharp injuries (AOR=2.76, 95%CI: 1.67, 4.72) (Table 4).

252 Table 4: Showing the association between independent variables with occupational
 253 exposure to sharp injuries among nurses working in public hospitals in south Gondar
 254 zone, Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Sharp injuries		COR (95%CI)	AOR (95%CI)
		Yes (%)	No (%)		
Sex	Male	108 (54.82)	66 (36.87)	2.15 (1.32,3.07)	1.98 (0.91,4.21)
	Female	89 (45.18)	113 (63.13)	1.00	1.00
Year of service	<5	59 (29.95)	77 (43.02)	1.00	1.00
	5-10	68 (34.52)	60 (33.52)	1.46 (0.87,2.42)	1.38 (0.72,2.64)
	>10	70 (35.53)	42 (23.46)	2.12 (1.26,3.49)	2.35 (1.21,4.57)***
Work load in the unit	Yes	125 (63.45)	87 (48.60)	1.73 (1.15,2.52)	1.42 (0.83,2.45)
	No	72 (36.55)	92 (51.40)	1.00	1.00
Training	Yes	38 (19.29)	51 (28.49)	0.48 (0.32,0.67)	0.54(0.29,0.92)****
	No	159 (80.71)	128 (71.51)	1.00	1.00
Nurses' knowledge of standard precaution	Adequate knowledge	59 (29.95)	75 (41.90)	1.00	1.00
	Inadequate knowledge	138 (70.05)	104 (58.10)	1.96 (1.31,2.94)	1.42 (0.79,2.39)
Nurses' job stress level	Stressed	149 (75.63)	88 (49.16)	2.45 (1.62,3.67)	2.24 (1.27,3.89)**
	Not stressed	48 (24.37)	91 (50.84)	1.00	1.00
Presence of contaminated sharps at workplace	Yes	136 (69.04)	78 (43.58)	2.71 (1.79,4.09)	2.76 (1.67,4.72)*
	No	61 (30.96)	101 (56.42)	1.00	1.00

255 *Significant at P=0.000, **Significant at P=0.005, ***Significant at P=0.011, and
 256 ****Significant at P=0.018.

257 Discussion

258 This study finding showed that the burden of occupational exposure to sharp injuries
 259 among nurses was 52.39%. This study finding also reported that years of service,

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3 260 infection prevention training, job related stress, and the presence of contaminated
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5 261 sharps at work place were significantly associated with the occurrence of occupational
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8 262 exposure to sharp injuries among nurses.
9

10 263 In this study, the burden of occupational exposure to sharp injuries among nurses was
11
12 264 52.39%. This finding is higher than a study conducted in three hospitals, Izmir,
13
14 265 Turkey(44.3%) [9], but lower than studies conducted in Public Sector Tertiary Care
15
16 266 Hospitals of Pakistan (67%) [16], and JUSH, Southwest Ethiopia (61.76%) [1]. This
17
18 267 variation might be due to the difference in study setting and period, as well as due to the
19
20 268 difference in infection prevention training and knowledge level of the respondents
21
22 269 towards standard precaution across study settings.
23
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25

26 270 In this study, year of service was significantly associated with the occurrence of
27
28 271 occupational exposure to sharp injuries among nurses at $p < 0.05$. This finding is similar
29
30 272 with studies conducted in three hospitals, Izmir, Turkey [9], and a secondary care
31
32 273 hospital, Gaza Strip [17], which showed that year of service had shown significant
33
34 274 association with the occurrence of occupational exposure to sharp injuries among
35
36 275 nurses at $p < 0.05$. It is due to the fact that as year of service increases, the chance of
37
38 276 getting occupational exposure to sharp injuries also increases.
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41

42 277 This study finding also indicated that nurses who got infection prevention training were
43
44 278 46% less likely to get the chance of occupational exposure to sharp injuries as
45
46 279 compared with nurses who didn't get the training. This finding is in line with a study
47
48 280 conducted in public hospitals of Jimma Zone, South West Ethiopia(8),which showed
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50 281 that nurses who got infection prevention training were 88% less likely to get the chance
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52 282 of getting occupational exposure to sharp injuries as compared with nurses who didn't
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3 283 get the training. It is due to the fact that getting infection prevention training helps to
4
5 284 understand and practice the standard precaution guide line easily, which in turn reduces
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7
8 285 the chance of getting occupational exposure to sharp injuries.

9
10 286 Similarly, this study finding also showed that job related stress was significantly
11
12 287 associated with the occurrence of occupational exposure to sharp injuries among
13
14
15 288 nurses. This finding is comparable with a study conducted in JUSH; Southwest Ethiopia
16
17 289 which reported that job-related stress had shown significant association with the
18
19 290 occurrence of occupational exposure to sharp injuries among nurses [1]. It is due to the
20
21 291 fact that job-related stress might make nurses to lose their concentration and practice
22
23
24 292 their daily activities unsafely.

25
26 293 Moreover, this study finding also showed that the presence of contaminated needles
27
28 294 and sharp materials at work was also significantly associated with the occurrence of
29
30
31 295 occupational exposure to sharp injuries among nurses at $P < 0.05$. This finding is in line
32
33 296 with a study conducted in JUSH, Southwest Ethiopia which reported the presence of
34
35 297 contaminated needles and sharp materials at the work place was significantly
36
37
38 298 associated with the occurrence of occupational exposure to sharp injuries among
39
40 299 nurses at $p < 0.05$ [1]. It is due to the fact that the presence of contaminated needles and
41
42 300 sharp materials at workplace increases the chance of getting occupational exposure to
43
44
45 301 sharp injuries among nurses in their day-to-day workplace activities.

46 302 **Limitation of the Study**

47
48
49 303 This study might be subjected to recall and social desirability biases.

50
51
52 304 The study also might not show cause and effect relationships while the study design
53
54 305 was cross sectional.

306 **Conclusion**

307 Generally, this study finding reported that the burden of occupational exposure to sharp
308 injuries among nurses was high. This study finding also showed that years of service,
309 infection prevention training, job related stress, and the presence of contaminated
310 sharps at workplace were independent predictors of occupational exposure to sharp
311 injuries among nurses working in public hospitals in south Gondar zone.

312 **Recommendations**

- 313 1. The Ministry of health, Amhara regional health bureau, different NGOs, and hospital
314 administrators in collaboration should strengthen regular provision of health & safety
315 information and infection prevention training to nurses at all levels.
- 316 2. All stakeholders, including nursing staffs, should strengthen their efforts to work
317 together to identify and manage those job-related stressors among nurses.
- 318 3. Safety boxes should be available in each working unit, and nurses should also
319 practice proper use of safety box more than ever in order to avoid the presence of
320 contaminated needles and other sharp materials at workplace.
- 321 4. Nurses should also use PPEs properly when handling and working with needles and
322 other sharp materials in order to reduce the chance of getting occupational exposure to
323 sharp injuries.

324 **Abbreviations and acronyms**

325	AIDS	Acquired Immune Deficiency Syndrome
326	AOR	Adjusted Odds Ratio
327	CI	Confidence Interval
328	EBN	European Biosafety Network

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2
3 329 ENSS Expanded Nursing Stress Scale
4

5 330 HBV Hepatitis B Virus
6

7 331 HCV Hepatitis C Virus
8

9 332 HIV Human Immune deficiency Virus
10

11 333 NGOs Non-Governmental Organizations
12

13 334 PPEs Personal Protective Equipments
14

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17 335 **Consent for Publication**
18

19 336 Not applicable
20

21
22 337 **Funding**
23

24 338 Not applicable
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26
27 339 **Data availability**
28

29 340 All data used for the study were included in the manuscript.
30

31
32 341 **Competing interests**
33

34 342 We declared that we have no any conflicts of interests.
35

36
37 343 **Authors' contributions**
38

39 344 Tigabu Munye Aytenew: Wrote the research proposal, conducted the study, did data
40 entry and analysis
41
42 345
43

44 346 Yohannes Tesfahun Kassie: Involved in data entry and analysis
45

46 347 Solomon Demis Kebede: Involved in proposal development, and data analysis.
47
48

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52 University, college of health science, for giving us the opportunity to conduct this study.
53
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56
57

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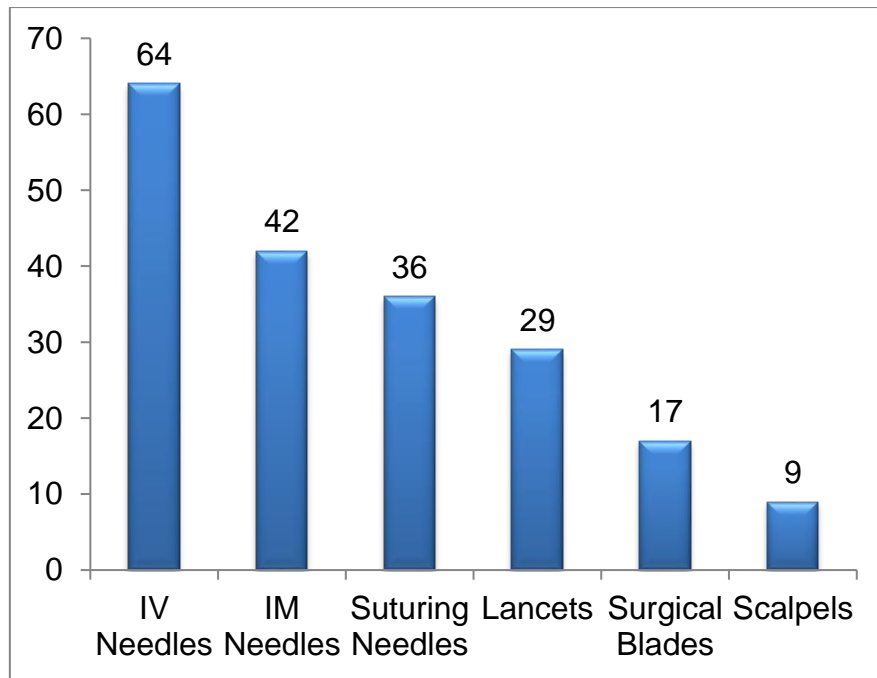


Figure 1: Distribution of sharp injuries by their type among nurses working in public hospitals in south Gondar zone, Northcentral Ethiopia, 2022 (n=376).

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

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			Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	1-3
Objectives	#3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	#4	Present key elements of study design early in the paper	4
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4

1	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
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4		#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give	5-6
5			diagnostic criteria, if applicable	
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7				
8	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment (measurement).	6-7
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10	measurement		Describe comparability of assessment methods if there is more than one group. Give information separately	
11			for for exposed and unexposed groups if applicable.	
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14	Bias	#9	Describe any efforts to address potential sources of bias	7
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17	Study size	#10	Explain how the study size was arrived at	5
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19	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings	7-8
20			variables	
21			were chosen, and why	
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24	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	7-8
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27	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	7-8
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29	Statistical methods	#12c	Explain how missing data were addressed	7-8
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32	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	7-8
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35	Statistical methods	#12e	Describe any sensitivity analyses	7-8
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37	Results			
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40	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for	9
41			eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	
42			separately for for exposed and unexposed groups if applicable.	
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46	Participants	#13b	Give reasons for non-participation at each stage	9
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49	Participants	#13c	Consider use of a flow diagram	10
50				
51	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures	10
52			and potential confounders. Give information separately for exposed and unexposed groups if applicable.	
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56	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	10
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1	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and	10-12
2			unexposed groups if applicable.	
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5	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95%	13-14
6			confidence interval). Make clear which confounders were adjusted for and why they were included	
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10	Main results	#16b	Report category boundaries when continuous variables were categorized	13-14
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12	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	13-14
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15	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	13-14
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18	Discussion			
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20	Key results	#18	Summarise key results with reference to study objectives	13-14
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23	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both	17
24			direction and magnitude of any potential bias.	
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27	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from	14-17
28			similar studies, and other relevant evidence.	
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32	Generalisability	#21	Discuss the generalisability (external validity) of the study results	17
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34	Other Information			
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37	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original	18
38			study on which the present article is based	
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BMJ Open

Magnitude of occupational exposure to sharp injuries among Nurses working in South Gondar zone public hospitals, Northcentral Ethiopia: Institution-based cross-sectional study

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Secondary Subject Heading:	Infectious diseases
Keywords:	Risk management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, INFECTIOUS DISEASES, Infection control < INFECTIOUS DISEASES, Safety

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3 1 **Magnitude of occupational exposure to sharp injuries among Nurses working in**
4
5 2 **South Gondar zone public hospitals, Northcentral Ethiopia: Institution-based**
6
7 3 **cross-sectional study**

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9
10 4 Tigabu Munye Aytnew^{1*}, Yohannes Tesfahun Kassie², Solomon Demis Kebede³

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35 15 **ABSTRACT**

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38 16 **Objective:** The study aimed to determine the magnitude of occupational exposure to
39
40 17 sharp injuries and identify its associated factors among nurses.

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43 18 **Design:** Institution-based cross-sectional study design was conducted from November
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45 19 01-30/2022.

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48 20 **Analysis:** The collected data were entered into Epi-Data version 4.2; then, exported to
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50 21 Stata version 14 for analysis. Variables with a p-value of <0.05 at 95% CI were
51
52 22 considered significantly associated with occupational exposure to sharp injuries.

53
54 23 **Setting:** The study was conducted in South Gondar zone public hospitals.

24 **Participants:** Nurses working in South Gondar zone public hospitals.

25 **Results:** Of the total respondents, 213 (56.65%) were between the age of 25-34 with
26 the mean \pm SD of age 30.22 ± 6.63 years. Similarly, 202 (53.72%) of the respondents
27 were females. This study finding showed that the magnitude of occupational exposure
28 to sharp injuries among nurses was 52.39% (95%CI: 47.92%, 56.37%). Moreover, this
29 study finding showed that year of service >10 years (AOR=2.35, 95%CI: 1.21,4.57),
30 lack of infection prevention training (AOR=1.85, 95%CI: 1.09, 3.45), job-related stress
31 (AOR=2.24, 95%CI: 1.27, 3.89) and presence of contaminated sharps at workplace
32 (AOR=2.76, 95%CI: 1.67, 4.72) were significantly associated with occupational
33 exposure to sharp injuries among nurses.

34 **Conclusions:** Generally, this study finding reported that the magnitude of occupational
35 exposure to sharp injuries among nurses was high. This study finding also showed that
36 years of service >10 years, lack of infection prevention training, job-related stress and
37 the presence of contaminated sharps at workplace were independent predictors of
38 occupational exposure to sharp injuries among nurses. Hence, all the concerned bodies
39 should strengthen regular provision of infection prevention training to nurses at all
40 levels. Nurses should practice proper use of safety box more than ever in order to avoid
41 the presence of contaminated needles and other sharp materials at workplace.

42 **Keywords:** Occupational exposure to sharp injuries, Nurses, Public hospitals.

43 **Strengths and limitations of this study**

- 44 ◆ The findings could be strong evidence as a result of using census method.
- 45 ◆ The study might be subjected to recall and social desirability biases.
- 46 ◆ The study also might not show cause and effect relationships.

47 BACKGROUND

48 A sharp injury is "an accidental penetrating wound with an instrument that is potentially
49 contaminated with the body fluid of another person" [1-10]. Sharp injuries occur when
50 health care providers perform their clinical activities in the health care facilities, such as
51 hospitals, health centers and clinics [3]. The majority of sharp injuries occur during
52 administering injections, securing IV lines, drawing blood, checking blood sugar,
53 recapping needles, poor handling and disposing of needles, and transferring blood or
54 body fluids from a syringe to a specimen container [3, 4].

55 Globally, of the total of 35 million health care providers, it is estimated that 3 million
56 experience sharp injuries every year; of these, nurses are at the greatest risk, with up to
57 50% of all sharp injuries being sustained by nurses [11, 12]. Because nurses have the
58 highest rate of encountering sharp injuries among health care providers due to their
59 prolonged exposure to needles and other sharp devices [13]. Most of these sharp
60 injuries (90%) occur in developing countries, where the burden of blood borne infections
61 in the general population is high and access to safety devices and personal protective
62 equipments (PPEs) is limited, specifically more common in sub-Saharan African
63 countries [14].

64 On average, health care providers in Africa suffer 2 to 4 sharp injuries every year [15].

65 In Sub-Saharan Africa, the magnitude of sharp injuries and their associated factors are
66 not clearly understood among health care providers [16]. A study conducted in Jimma
67 University Specialized Teaching Hospital (JUSTH), Ethiopia reported that the magnitude
68 of occupational exposure to sharp injuries among nurses was 61.76% [3]. Sharp injuries
69 are markedly the most common and preventable occupational hazards that health care

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3 70 providers are exposed to and become high risk for the transmission of a variety of blood
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5 71 borne infections, such as hepatitis B virus (HBV), hepatitis C virus (HCV) and human
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7 72 immunodeficiency virus (AIDS) [17, 18].
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10 73 Blood-borne infections following sharp injuries have serious consequences, including
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12 74 long-term illness, psychological stress to the victims ,colleagues and family, disability
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15 75 and death [19]. In addition to the potential risks for infectious diseases, they also suffer
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17 76 for direct costs required for laboratory tests, including tests for HIV antibodies, hepatitis
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19 77 B serology and a baseline test for hepatitis C as well as any treatments for these
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21 78 infections [20]. The implementation of education, universal precautions, elimination of
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23 79 needle recapping, and use of sharp containers for safe disposal have reduced the
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25 80 chance of getting sharp injuries by 80% [6, 21].
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29 81 Health care providers who followed universal precautions were 66% less likely to have
30
31 82 needle sticks and sharp injuries than those who did not follow [22]. Training of handling
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33 83 objects, using instruments to grasp needles, reduction of the use of sharp devices,
34
35 84 avoiding hand-to-hand passing of sharp instruments, decreasing of direct contact with
36
37 85 needles, an appropriate disposal and using safety boxes properly can decrease the risk
38
39 86 of getting sharp injuries [23].
40
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43 87 In Ethiopia, where primary health care services are covered by nurses, it is important to
44
45 88 develop their knowledge and practice on universal precautions since the risks of getting
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47 89 infections following sharp injuries are high in their day to day activities [4]. However,
48
49 90 there is limited information in the study area that describes the magnitude of sharp
50
51 91 injuries and its predictors among nurses. Therefore, this study aimed to determine the
52
53 92 magnitude of occupational exposure to sharp injuries and identify its associated factors.
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93 **General objective**

94 To assess the magnitude of occupational exposure to sharp injuries among nurses
95 working in South Gondar zone public hospitals, Northcentral Ethiopia from November
96 01-30, 2022

97 **Specific objectives**

98 To determine the magnitude of occupational exposure to sharp injuries among nurses
99 working in South Gondar zone public hospitals, Northcentral Ethiopia from November
100 01-30, 2022.

101 To identify the predictors of occupational exposure to sharp injuries among nurses
102 working in South Gondar zone public hospitals, Northcentral Ethiopia from November
103 01-30, 2022.

104 **METHODS**

105 **Study design, area and Period**

106 Institution-based cross-sectional study design was conducted among nurses working in
107 South Gondar zone public hospitals from November 01-30, 2022. South Gondar is one
108 of the zonal administrations in Amhara region, Northern Ethiopia with an estimated area
109 of 14,095.19 square kilometers. It is located by South and North Wollo zones in the
110 East, Bahirdar Liyu zone and Lake Tana in the West, Central Gondar in the North,
111 Waghimra zone in the Northeast and East and West Gojjam zones in the South (Figure
112 1). There are ten public hospitals in the zone, namely Debre Tabor comprehensive
113 specialized hospital, Addis Zemen, Ebnat, Mekane-Eyesus, Andabet, Wogeda, Woreta,
114 Nefas Mewucha, Dr. Ambachew Makonnen and Migbaru Kebede primary hospitals.

115 **Source Population**

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3 116 All nurses working in all South Gondar zone public hospitals.
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6 117 **Study Population**
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8 118 All nurses working in all South Gondar zone public hospitals.
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11 119 **Inclusion and exclusion criteria**
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13 120 All nurses working in all South Gondar zone public hospitals at the time of the data
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15 121 collection period were included in the study; whereas nurses who were on sick leave,
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17 122 maternity leave, annual leave, and training at the time of data collection period were
18
19 123 excluded from the study.
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22 124 **Patient and public involvement**
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25 125 None
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27 126 **Sample size determination**
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29
30 127 The sample size (n) was calculated by Computer-based Epi info7 software using a
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32 128 single population proportion at 95% CI, with a 5% margin of error, and by assuming the
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34 129 burden of occupational exposure to sharp injuries among nurses to be 61.76% [3].
35

$$n = \frac{(Z_{\alpha/2})^2 P (1-P)}{d^2}$$

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37 130
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40 132 *Where:* - n= the minimum sample size required for the study

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42 133 Z= standard normal distribution (Z=1.96) with a 95% confidence interval

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44 134 P= burden of occupational exposure to sharp injuries among nurses

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46 135 (61.76%=0.6176)

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48 136 d= is a tolerable margin of error (d=5%=0.05)

$$n = \frac{(1.96)^2 0.6176(1-0.6176)}{(0.05)^2}$$

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3 139 n=363. Then, by adding a 10% (0.1) non-response rate, the final sample size
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5 140 (n) was calculated to be 400. But, since it was the minimum sample size required, and
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7 141 the source population was only 402, the source population (402) was taken as a sample
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10 142 size for this study (census method was used).

11 12 143 **Dependent Variable**

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15 144 Occupational exposure to sharp injuries

16 17 145 **Independent variables**

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20 146 Socio-demographic characteristics: Age, sex, marital status, level of education and
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22 147 years of service.

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25 148 Behavioral characteristics: Sleeping disturbance, following of standard precaution guide
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27 149 line, use of PPE, knowledge of standard precautions and job-related stress.

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29 150 Work environment characteristics: Length of stay/shift, health and safety information
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31 151 access, infection prevention training, work load, availability of safety box, availability of
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33 152 standard precaution guidelines and presence of contaminated sharps.

34 35 153 **Operational Definitions**

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39 154 **Occupational exposure to sharp injuries:** Any kind of needle stick and/or other sharp
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41 155 injury which occurred among nurses in relation to his/her job in the health care facility
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43 156 [4].

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46 157 **Knowledge:** Nurses who have scored $\geq 75\%$ (9) of 12 knowledge-related questions
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48 158 were considered to have adequate knowledge; whereas nurses who have scored below
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50 159 75% were also considered to have inadequate knowledge towards sharp injuries [24].

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53 160 **Job-related stress:** Nurses who scored above or equal to the mean score (32.78) of
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55 161 the Likert-scale questions that used to assess nurses' job-related stress were

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3 162 considered they have a job-related stress, whereas nurses who scored below the mean
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5 163 score were also considered they didn't have job-related stress [25].
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8 164 **Workload:** When one trained intensive care unit (ICU) nurse provides nursing care
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10 165 services for more than two patients in the ICU, and when one nurse provides nursing
11
12 166 care services for more than 6 patients in inpatient departments per shift [25].
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14
15 167 **Sleeping disturbance:** The presence of sleeping problems while the health care
16
17 168 provider is at workplace [25].
18

19 169 **Data collection tool and procedure**

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22 170 A structured and pre-tested self-administered English version questionnaire was used to
23
24 171 collect the data. The questionnaire was prepared by reviewing different literatures [3, 4,
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26 172 25], and using standardized Expanded Nursing Stress Scale (ENSS) Likert-scale
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28 173 questions to assess job-related stress of the respondents [3, 4, 25].
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30
31 174 The questionnaire contains nurses' socio-demographic, behavioral, environmental
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33 175 characteristics, knowledge questions related to standard precaution and standardized
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35 176 Likert-scale questions to assess job-related stress of the respondents. Reliability of the
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37 177 tool was established with an overall Cronbach's alpha score (0.74 for knowledge
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39 178 questions related to standard precaution, and 0.79 for job-related stress Likert-scale
40
41 179 questions). Training was given to the data collectors, and before giving the
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43 180 questionnaire, the data collectors informed the nurses about the aims/purposes, risks
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45 181 and possible benefits of the study, the right and refusal to participate in the study, and
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47 182 that the collected information would be kept confidential.
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3 183 After all, those nurses who were willing and have signed the informed voluntary consent
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5 184 form were requested to fill out the questionnaire. The data collection was held for four
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8 185 consecutive weeks (from November 01-30/2022).
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10 186 **Data quality control**

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12 187 Five percent of the questionnaire was pre-tested from October 23-27/2022 in Koladiba
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15 188 primary hospital to assess the reliability, clarity, consistency, understandability and the
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17 189 total time that it would take to complete the questionnaire prior to the actual data
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20 190 collection. Then, the necessary comments and feedback were incorporated in the final
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22 191 tool to improve its quality. Training was given for the data collectors regarding the
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24 192 objective of the study, data collection tool, ways of data collection, checking the
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26 193 completeness of the collected data, and how to maintain confidentiality.

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29 194 The collected data were checked for completeness, cleaned, edited, coded manually,
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31 195 and entered into Epi data version 4.2. Double data entry was done for its validity, and
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33 196 compared to the original data. Outliers were checked, and simple frequencies and cross
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36 197 tabulation were done for missing values and variables.
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38 198 **Data processing and analysis**

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41 199 Then after, the data were exported to Stata version 14 for analysis. Descriptive analysis
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43 200 was done by computing proportions and summary statistics. The information was
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45 201 presented using simple frequencies, summary measures, tables, and figures. Binary
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48 202 logistic regression was used to identify the associated factors of occupational exposure
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50 203 to sharp injuries. Bivariate and multivariate analyses were used to see the association
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52 204 between the outcome variable, and each independent variable. The assumptions for
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205 binary logistic regression were checked. The goodness of fit was tested by Hosmer-
 206 Lemeshow statistics and Omnibus tests.

207 All variables with $P < 0.2$ in the bivariate analysis were included in the final multivariable
 208 analysis model in order to control all the possible confounders, and the variables were
 209 selected using enter method. The adjusted odds ratio (AOR) along with a 95% CI was
 210 estimated to identify the associated factors of occupational exposure to sharp injuries.
 211 In this study, variables with a P-value of < 0.05 were considered significantly associated
 212 with occupational exposure to sharp injuries.

213 RESULTS

214 Of the total of 402 respondents, 376 were included in the final analysis, giving a
 215 response rate of 93.53%.

216 Socio-demographic and working environment related attributes

217 Of the total respondents, 213 (56.65%) were between the age of 25-34 with the mean \pm
 218 SD of age 30.22 ± 6.63 years. Similarly, 202 (53.72%) of the respondents were females.
 219 Additionally, only 89 (23.67%) of the respondents got infection prevention training.
 220 Moreover, 271 (72.07%) of them had safety boxes at workplace to dispose needles and
 221 other sharp materials after use, and 214 (56.91%) of respondents also stated that there
 222 were contaminated needles and sharp materials at workplace (Table 1).

225 Table 1: Socio-demographic characteristics of the respondents working in South
 226 Gondar zone public hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Category	Frequency	Percentage (%)
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Age	≤24	68	18.09
	25-34	213	56.65
	35-44	71	18.88
	≥45	24	6.38
Sex	Male	174	46.28
	Female	202	53.72
Marital status	Single	171	45.48
	Married	183	48.67
	Divorced	17	4.52
	Widowed	5	1.33
Educational level	Diploma	132	35.11
	BSc	244	64.89
Years of service	<5	136	36.17
	5-10	128	34.04
	>10	112	29.79
Sleeping disturbance problem	Yes	274	72.87
	No	102	27.13
Use of PPEs	All of the time	185	49.20
	Most of the time	102	27.13
	Sometimes	73	19.41
	Never use	16	4.26
Workload in the unit	Yes	212	56.38
	No	164	43.62
Length of stay/shift at work	≤8 hours	193	51.33
	9-14 hours	35	9.31
	≥15 hours	148	39.36
Health and safety information access	Yes	291	77.39
	No	85	22.61
Training on IP	Yes	89	23.67
	No	287	76.33

Availab. of safety box at workplace	Yes	271	72.07
	No	105	27.93
Availab. of universal precaution guide line	Yes	212	56.38
	No	164	43.62
Following universal precaution guide line	Yes	93	43.87
	No	119	56.13
Presence of contaminated sharps at workplace	Yes	214	56.91
	No	162	43.09
Knowledge of standard precaution	Adequate knowledge	134	35.64
	Inadequate knowledge	242	64.36
Job-related stress	Stressed	237	63.03
	Not stressed	139	36.97

227 *BSc, Bachelor of Science; *IP, infection prevention; PPEs, personal protective
228 equipments

229 **Magnitude of occupational exposure to sharp injuries**

230 This study finding showed that the magnitude of occupational exposure to sharp injuries
231 among nurses was 52.39% (95%CI: 47.92%, 56.37%) (197).

232 The occurrence of occupational exposure to sharp injuries was the highest among
233 respondents with the age of 45 years and above (62.50). Likewise, the majority of
234 males, 108(62.07) also got occupational exposure to sharp injuries. Occupational
235 exposure to sharp injuries was also the highest among diploma nurses, and nurses
236 having more than 10 years of service (59.85% and 62.50%) respectively. Moreover, the
237 occurrence of sharp injuries was also the highest among nurses working along with the
238 presence of contaminated sharps at workplace (63.55%) (Table 2).

239 Table 2: Distribution of sharp injuries among nurses working in South Gondar zone
240 public hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Occupational exposure to sharp injuries
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		Yes (%)	No (%)
Age	≤24	32(47.06)	36(52.94)
	25-34	111(52.11)	102(47.89)
	35-44	39(54.93)	32(45.07)
	≥45	15(62.50)	9(37.50)
Sex	Male	108(62.07)	66(37.93)
	Female	89(44.06)	113(55.94)
Marital status	Single	87(50.88)	84(49.12)
	Married	96(52.46)	87(47.54)
	Divorced	11(64.71)	6(32.29)
	Widowed	3(60.0)	2(40.0)
Educational level	Diploma	79(59.85)	53(40.15)
	BSc	118(48.36)	126(51.64)
Year of service	<5	59(43.38)	77(56.62)
	5-10	68(53.13)	60(46.87)
	>10	70(62.50)	42(37.50)
Sleeping disturbance problem	Yes	141(51.46)	133(48.54)
	No	56(54.90)	46(45.10)
Use of PPEs	All of the time	89(48.11)	96(51.89)
	Most of the time	56(54.90)	46(45.10)
	Sometimes	41(56.16)	32(43.84)
	Never use	11(58.75)	5(31.25)
Workload	Yes	125(58.96)	87(41.04)
	No	72(43.90)	92(56.10)
Length of stay/shift at work	≤8 hours	95(49.22)	98(50.78)
	9-14 hours	19(54.29)	16(45.71)
	≥15 hours	83(56.08)	65(43.92)
Health & safety information access	Yes	148(50.86)	143(49.14)
	No	49(57.65)	36(42.35)
Training on IP	Yes	38(42.70)	51(57.30)
	No	159(55.40)	128(44.60)

Availab. of safety box	Yes	129(47.60)	142(52.40)
	No	68(64.76)	37(35.24)
Availab. of universal precaution guide line	Yes	99(46.70)	113(53.30)
	No	98(59.76)	66(40.24)
Following universal precaution guide line	Yes	42 (45.16)	51(54.84)
	No	155 (54.77)	128 (45.23)
Presence of contaminated sharps at workplace	Yes	136(63.55)	78(36.45)
	No	61(37.65)	101(62.35)
Knowledge of standard precaution	Adequate knowledge	59(44.03)	75(55.97)
	Inadequate knowledge	138(57.02)	104(42.98)
Job-related stress	Stressed	149(62.87)	88(37.13)
	Not stressed	48(34.53)	91(65.47)

241 *BSc, Bachelor of Science; PPEs, personal protective equipments; and IP, infection
242 prevention

243 Occupational exposure to sharp injuries related Attributes

244 Of the respondents who encountered occupational exposure to sharp injuries,
245 114(57.87%) had encountered sharp injuries 1-2 times. Additionally, 69 (35.03%) of
246 injuries occurred during abrupt movement of patients, and 86(43.65%) sharp injuries
247 were slight skin penetration. Moreover, 93 (47.21%) of injuries were from the unknown
248 status, and only 92 (46.70%) sharp injuries were reported to the concerned body (Table
249 3).

250 Table 3: Occupational exposure to sharp injuries related attributes among nurses
251 working in South Gondar zone public hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Values	Frequency	Percentage (%)
Frequency of injuries occurred	1-2 times	114	57.87
	3-4 times	71	36.04
	≥5 times	12	6.09
Condition of sharps	Dirty needles/sharps	74	37.56

	Sterile needles/sharps	58	29.45
	Both dirty & sterile needles/sharps	65	32.99
How sustaining injuries	During abrupt movement of patients	69	35.03
	During recapping needle after use	63	31.98
	During sharp collection	46	23.35
	Others	19	9.64
Type of injuries sustained	Deep injury	54	27.41
	Slight skin penetration	86	43.65
	Superficial injury	57	28.94
Health status of the source patients	Known HIV/AIDS positive	37	18.78
	Clinically suspected HIV/AIDS	40	20.30
	Clinically diagnosed hepatitis B patient	27	13.17
	Unknown status	93	47.21
Report of the injuries	Yes	92	46.70
	No	105	53.30

252 *HIV/AIDS, Human immune deficiency virus/Acquired immune deficiency syndrome

253 **Distribution of sharp injuries by their type**

254 The types of sharps that cause injuries to nurses were intravenous needles,
 255 64(32.49%), intramuscular needles, 42(21.32%), suturing needles, 36(18.27%), lancets,
 256 29 (14.72%), surgical blades, 17 (8.63%) and scalpels, 9 (4.57%).

257 **Factors associated with occupational exposure to sharp injuries**

258 Nurses having above 10 years of service were 2.35 times more likely to encounter
 259 occupational exposure to sharp injuries than nurses having less than 5 years of service
 260 (AOR=2.35, 95%CI: 1.21,4.57). On the other hand, nurses who didn't get infection
 261 prevention training were 1.85 times more likely to encounter occupational exposure to

262 sharp injuries (AOR=1.85, 95%CI: 1.09, 3.45). Additionally, nurses having job-related
 263 stress were also 2.24 times more likely to be exposed for sharp injuries (AOR=2.24,
 264 95%CI: 1.27, 3.89), and nurses who were working in the area with the presence of
 265 contaminated sharps were 2.76 times more likely to get the chance of occupational
 266 exposure to sharp injuries (AOR=2.76, 95%CI: 1.67, 4.72) (Table 4).

267 Table 4: Showing the association between independent variables with occupational
 268 exposure to sharp injuries among nurses working in South Gondar zone public
 269 hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Sharp injuries		COR (95%CI)	AOR (95%CI)
		Yes (%)	No (%)		
Sex	Male	108 (54.82)	66 (36.87)	2.15 (1.32,3.07)	1.98 (0.91,4.21)
	Female	89 (45.18)	113 (63.13)	1.00	1.00
Year of service	<5	59 (29.95)	77 (43.02)	1.00	1.00
	5-10	68 (34.52)	60 (33.52)	1.46 (0.87,2.42)	1.38 (0.72,2.64)
	>10	70 (35.53)	42 (23.46)	2.12 (1.26,3.49)	2.35 (1.21,4.57) ***
Workload in the unit	Yes	125 (63.45)	87 (48.60)	1.73 (1.15,2.52)	1.42 (0.83,2.45)
	No	72 (36.55)	92 (51.40)	1.00	1.00
Training	Yes	38 (19.29)	51 (28.49)	1.00	1.00
	No	159 (80.71)	128 (71.51)	2.08 (1.49, 3.13)	1.85(1.09, 3.45) ****
Nurses' knowledge of standard precaution	Adequate knowledge	59 (29.95)	75 (41.90)	1.00	1.00
	Inadequate knowledge	138 (70.05)	104 (58.10)	1.96 (1.31,2.94)	1.42 (0.79,2.39)
Nurses' job stress level	Stressed	149 (75.63)	88 (49.16)	2.45 (1.62,3.67)	2.24 (1.27,3.89) **
	Not stressed	48 (24.37)	91 (50.84)	1.00	1.00
Presence of contaminated sharps	Yes	136 (69.04)	78 (43.58)	2.71 (1.79,4.09)	2.76 (1.67,4.72) *
	No	61 (30.96)	101 (56.42)	1.00	1.00

270 *Significant at P=0.000, **Significant at P=0.005, ***Significant at P=0.011, and

271 ****Significant at P=0.018.

272 DISCUSSION

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3 273 This study finding showed that the magnitude of occupational exposure to sharp injuries
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5 274 among nurses was 52.39%. This study finding also reported that years of service >10
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8 275 years, lack of infection prevention training, job-related stress, and the presence of
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10 276 contaminated sharps at workplace were significantly associated with the occurrence of
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12 277 occupational exposure to sharp injuries among nurses.

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15 278 In this study, the magnitude of occupational exposure to sharp injuries among nurses
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17 279 was 52.39%. This finding was higher than a study conducted in three hospitals, Izmir,
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19 280 Turkey (44.3%) [18], but lower than studies conducted in Public Sector Tertiary Care
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21 281 Hospitals of Pakistan (67%) [26], and JUSH, Southwest Ethiopia (61.76%) [3]. This
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23 282 variation might be due to the difference in study setting and period, as well as due to the
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25 283 difference in infection prevention training and knowledge level of the respondents
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27 284 towards standard precaution across study settings.

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31 285 In this study, year of service >10 years was significantly associated with the occurrence
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33 286 of occupational exposure to sharp injuries among nurses at $p < 0.05$. This finding was
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35 287 similar with studies conducted in three hospitals, Izmir, Turkey [18], and a secondary
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37 288 care hospital, Gaza Strip [27], which showed that year of service had shown significant
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39 289 association with the occurrence of occupational exposure to sharp injuries among
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41 290 nurses at $p < 0.05$. It might be due to the fact that as year of service increases, the
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43 291 chance of getting occupational exposure to sharp injuries also increases.

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47 292 This study finding also indicated that nurses who didn't get infection prevention training
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49 293 were 1.85 times more likely to get the chance of occupational exposure to sharp injuries
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51 294 compared to nurses who got the training. This finding was in line with a study
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53 295 conducted in public hospitals of Jimma Zone, South West Ethiopia [4], which showed

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3 296 that nurses who didn't get infection prevention training were 8.33 times more likely to
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5 297 get the chance of occupational exposure to sharp injuries compared to nurses who got
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7 298 the training. It is due to the fact that getting infection prevention training helps to
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9 299 understand and practice the standard precaution guide line easily, which in turn reduces
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11 300 the chance of getting occupational exposure to sharp injuries.

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14 301 Similarly, this study finding also showed that job-related stress was significantly
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16 302 associated with the occurrence of occupational exposure to sharp injuries among
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18 303 nurses. This finding was comparable with a study conducted in JUSH, Southwest
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20 304 Ethiopia which reported that job-related stress had shown significant association with
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22 305 the occurrence of occupational exposure to sharp injuries among nurses [14]. It could
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24 306 be explained that job-related stress might make nurses to lose their concentration and
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26 307 practice their daily activities unsafely.

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29 308 Moreover, this study finding also showed that the presence of contaminated needles
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31 309 and sharp materials at workplace was also significantly associated with the occurrence
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33 310 of occupational exposure to sharp injuries among nurses at $P < 0.05$. This finding was
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35 311 congruent with a study conducted in JUSH, Southwest Ethiopia which reported that the
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37 312 presence of contaminated needles and sharp materials at the workplace was
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39 313 significantly associated with the occurrence of occupational exposure to sharp injuries
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41 314 among nurses at $p < 0.05$ [3]. The presence of contaminated needles and sharp
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43 315 materials at workplace increases the chance of getting occupational exposure to sharp
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45 316 injuries among nurses in their day-to-day workplace activities.

317 **Strengths and limitations of this study**

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3 318 The study used census method, as a result, the findings could be strong evidence for
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5 319 the problem. However, the study might be subjected to recall and social desirability
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7 320 biases. The study also might not show cause and effect relationships while the study
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9 321 design was cross sectional.
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11 322 **CONCLUSIONS**

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15 323 Generally, this study finding reported that the magnitude of occupational exposure to
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17 324 sharp injuries among nurses was high. Moreover, this study finding also showed that
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19 325 years of service >10 years, lack of infection prevention training, job-related stress, and
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21 326 the presence of contaminated sharps at workplace were independent predictors of
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23 327 occupational exposure to sharp injuries among nurses.
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26 328 **Prevention and control strategies**

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29 329 Continually educate the health care team: To achieve the desired infection prevention
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31 330 and control goals, training on infection prevention and control should be given to the
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33 331 staff on a continual basis covering the standard infection prevention and control
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35 332 precautions.
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38 333 Conducting regular clinical audits: It used to ensure best practice of the standard
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40 334 infection prevention and control precautions such as proper use of personal protective
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42 335 equipments, disposal of used needles and other sharps and hand hygiene.
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45 336 Creating a cleanliness culture: By building a clean culture, staff are aware of the
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47 337 benefits of infection prevention and control.
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50 338 **Recommendations**

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52 339 All the concerned bodies should strengthen regular provision of infection prevention
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54 340 training to the nurses at all levels. Stakeholders, including nursing staffs should also
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3 341 strengthen their efforts to work together to identify and manage the possible job-related
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5 342 stressors among nurses. Furthermore, safety boxes should be available in each working
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8 343 unit, and nurses should also practice proper use of safety box more than ever in order
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10 344 to avoid the presence of contaminated needles and other sharp materials at workplace.

11 345 **Abbreviations and acronyms**

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15 346 AIDS: Acquired Immune Deficiency Syndrome

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17 347 AOR: Adjusted Odds Ratio

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19 348 CI: Confidence Interval

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21 349 EBN: European Biosafety Network

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23 350 ENSS: Expanded Nursing Stress Scale

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25 351 HBV: Hepatitis B Virus

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27 352 HCV: Hepatitis C Virus

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29 353 HIV: Human Immune deficiency Virus

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31 354 ICU: Intensive Care Unit

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33 355 PPEs: Personal Protective Equipments

34 356 **Consent for Publication**

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36 357 Not applicable.

37 358 **Funding**

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39 359 Not applicable.

40 360 **Data availability**

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42 361 All data used for the study were included in the manuscript.

43 362 **Competing interests**

44
45 363 We declared that we have no any conflicts of interests.

364 **Patient and public involvement**

365 Patients and/or the public were not involved in the design, or conduct, or reporting, or
366 dissemination plans of the research.

367 **Patient consent for publication**

368 Consent was obtained from the respondents.

369 **Ethical approval**

370 The study involved human participants and was approved by Debre Tabor University,
371 College of Health Sciences, ethical review board (Ref No.CHS/048/2022). All the
372 respondents were informed about the purpose of the study, their right to refuse, and
373 written and signed voluntary consent was obtained from all the respondents prior to
374 data collection. The respondents were told that the information obtained from them
375 would be treated with complete confidentiality, and would not cause any harm to them.

376 **Provenance and peer review**

377 Not commissioned; externally reviewed.

378 **Contributors**

379 Tigabu Munye Aytenuw: Wrote the research proposal, conducted the study, did data
380 entry and analysis.

381 Yohannes Tesfahun Kassie: Involved in data entry and analysis.

382 Solomon Demis Kebede: Involved in proposal development, and data analysis.

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3 386 Secondly, we would like to thank hospital administrators for their permission and unlimited
4
5 387 support. Lastly, we also give our heartfelt thanks to all nurses who have participated in this
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8 388 study.

9
10 389 **Figure 1:** Map of South Gondar Zone (Source; Ethio GIS, 1994).

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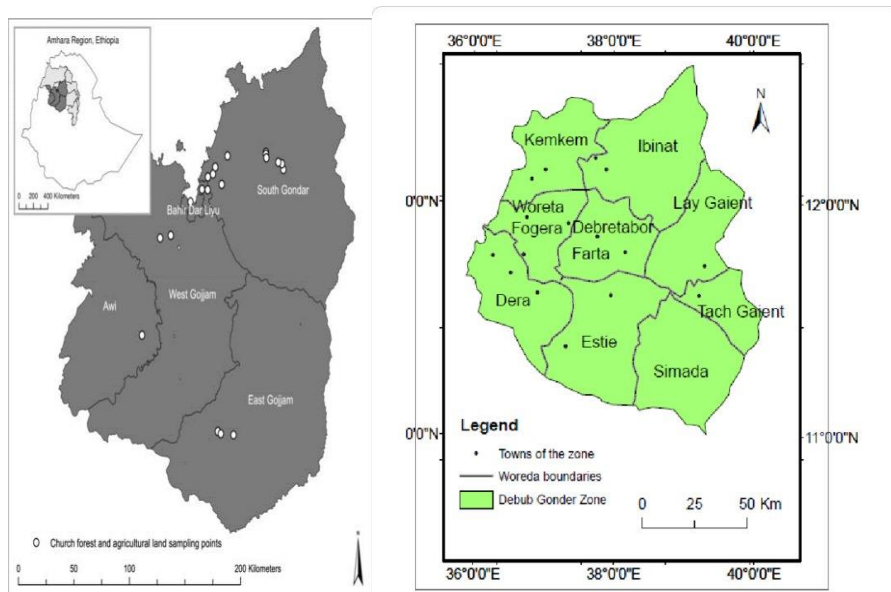


Figure 1: Map of South Gondar Zone (Source; Ethio GIS, 1994)

er review only

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

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Reporting Item	Page Number
Title and abstract	
Title #1a Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract #1b Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction	
Background / #2 Explain the scientific background and rationale for the investigation being reported rationale	1-3
Objectives #3 State specific objectives, including any prespecified hypotheses	4
Methods	
Study design #4 Present key elements of study design early in the paper	4
Setting #5 Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4

1	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
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4		#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give	5-6
5			diagnostic criteria, if applicable	
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8	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment (measurement).	6-7
9	measurement		Describe comparability of assessment methods if there is more than one group. Give information separately	
10			for for exposed and unexposed groups if applicable.	
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14	Bias	#9	Describe any efforts to address potential sources of bias	7
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17	Study size	#10	Explain how the study size was arrived at	5
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19	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings	7-8
20	variables		were chosen, and why	
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24	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	7-8
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27	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	7-8
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29	Statistical methods	#12c	Explain how missing data were addressed	7-8
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32	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	7-8
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34	Statistical methods	#12e	Describe any sensitivity analyses	7-8
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37	Results			
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40	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for	9
41			eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	
42			separately for for exposed and unexposed groups if applicable.	
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46	Participants	#13b	Give reasons for non-participation at each stage	9
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49	Participants	#13c	Consider use of a flow diagram	10
50				
51	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures	10
52			and potential confounders. Give information separately for exposed and unexposed groups if applicable.	
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56	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	10
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1	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and	10-12
2			unexposed groups if applicable.	
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5	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95%	13-14
6			confidence interval). Make clear which confounders were adjusted for and why they were included	
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10	Main results	#16b	Report category boundaries when continuous variables were categorized	13-14
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12	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	13-14
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15	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	13-14
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18	Discussion			
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20	Key results	#18	Summarise key results with reference to study objectives	13-14
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23	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both	17
24			direction and magnitude of any potential bias.	
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27	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from	14-17
28			similar studies, and other relevant evidence.	
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32	Generalisability	#21	Discuss the generalisability (external validity) of the study results	17
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34	Other Information			
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37	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original	18
38			study on which the present article is based	
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43 2023 using <https://www.goodreports.org/>, a tool made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)
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BMJ Open

Magnitude of occupational exposure to sharp injuries among Nurses working in South Gondar zone public hospitals, Northcentral Ethiopia: Institution-based cross-sectional study

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Primary Subject Heading:	Occupational and environmental medicine
Secondary Subject Heading:	Infectious diseases
Keywords:	Risk management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, INFECTIOUS DISEASES, Infection control < INFECTIOUS DISEASES, Safety

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3 1 **Magnitude of occupational exposure to sharp injuries among Nurses working in**
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5 2 **South Gondar zone public hospitals, Northcentral Ethiopia: Institution-based**
6
7 3 **cross-sectional study**
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9

10 4 Tigabu Munye Aytnew^{1*}, Yohannes Tesfahun Kassie², Solomon Demis Kebede³

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34
35 15 **ABSTRACT**

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38 16 **Objective:** The study aimed to determine the magnitude of occupational exposure to
39
40 17 sharp injuries and identify its associated factors among nurses.

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43 18 **Design:** Institution-based cross-sectional study design was conducted from November
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45 19 01-30/2022.

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47
48 20 **Analysis:** The collected data were entered into Epi-Data version 4.2; then, exported to
49
50 21 Stata version 14 for analysis. Variables with a p-value of <0.05 at 95% CI were considered
51
52 22 significantly associated with occupational exposure to sharp injuries.

53
54 23 **Setting:** The study was conducted in South Gondar zone public hospitals.
55
56
57

24 **Participants:** Nurses working in South Gondar zone public hospitals.

25 **Results:** Of the total respondents, 213 (56.65%) were between the age of 25-34 with the
26 mean \pm SD of age 30.22 \pm 6.63 years. Similarly, 202 (53.72%) of the respondents were
27 females. This study finding showed that the magnitude of occupational exposure to sharp
28 injuries among nurses was 52.39% (95%CI: 47.92%, 56.37%). Moreover, this study
29 finding showed that year of service >10 years (AOR=2.35, 95%CI: 1.21,4.57), lack of
30 infection prevention training (AOR=1.85, 95%CI: 1.09, 3.45), job-related stress
31 (AOR=2.24, 95%CI: 1.27, 3.89) and presence of contaminated sharps at workplace
32 (AOR=2.76, 95%CI: 1.67, 4.72) were significantly associated with occupational exposure
33 to sharp injuries among nurses.

34 **Conclusions:** Generally, this study finding reported that the magnitude of occupational
35 exposure to sharp injuries among nurses was high. This study finding also showed that
36 years of service >10 years, lack of infection prevention training, job-related stress and the
37 presence of contaminated sharps at workplace were independent predictors of
38 occupational exposure to sharp injuries among nurses. Hence, all the concerned bodies
39 should strengthen regular provision of infection prevention training to nurses at all levels.
40 Nurses should practice proper use of safety box more than ever in order to avoid the
41 presence of contaminated needles and other sharp materials at workplace.

42 **Keywords:** Occupational exposure to sharp injuries, Nurses, Public hospitals.

43 **Strengths and limitations of this study**

- 44 ◆ The findings could be strong evidence as a result of using census method.
- 45 ◆ The study might be subjected to recall and social desirability biases.
- 46 ◆ The study also might not show cause and effect relationships.

47 **BACKGROUND**

48 A sharp injury is "an accidental penetrating wound with an instrument that is potentially
49 contaminated with the body fluid of another person" [1-10]. Sharp injuries occur when
50 health care providers perform their clinical activities in the health care facilities, such as
51 hospitals, health centers and clinics [3]. The majority of sharp injuries occur during
52 administering injections, securing IV lines, drawing blood, checking blood sugar,
53 recapping needles, poor handling and disposing of needles, and transferring blood or
54 body fluids from a syringe to a specimen container [3, 4].

55 Globally, of the total of 35 million health care providers, it is estimated that 3 million
56 experience sharp injuries every year; of these, nurses are at the greatest risk, with up to
57 50% of all sharp injuries being sustained by nurses [11, 12]. Because nurses have the
58 highest rate of encountering sharp injuries among health care providers due to their
59 prolonged exposure to needles and other sharp devices [13]. Most of these sharp injuries
60 (90%) occur in developing countries, where the burden of blood borne infections in the
61 general population is high and access to safety devices and personal protective
62 equipments (PPEs) is limited, specifically more common in sub-Saharan African countries
63 [14].

64 On average, health care providers in Africa suffer 2 to 4 sharp injuries every year [15]. In
65 Sub-Saharan Africa, the magnitude of sharp injuries and their associated factors are not
66 clearly understood among health care providers [16]. A study conducted in Jimma
67 University Specialized Teaching Hospital (JUSTH), Ethiopia reported that the magnitude
68 of occupational exposure to sharp injuries among nurses was 61.76% [3]. Sharp injuries
69 are markedly the most common and preventable occupational hazards that health care

1
2
3 70 providers are exposed to and become high risk for the transmission of a variety of blood
4
5 71 borne infections, such as hepatitis B virus (HBV), hepatitis C virus (HCV) and human
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7 72 immunodeficiency virus (AIDS) [17, 18].
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10 73 Blood-borne infections following sharp injuries have serious consequences, including
11
12 74 long-term illness, psychological stress to the victims ,colleagues and family, disability and
13
14 75 death [19]. In addition to the potential risks for infectious diseases, they also suffer for
15
16 76 direct costs required for laboratory tests, including tests for HIV antibodies, hepatitis B
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18 77 serology and a baseline test for hepatitis C as well as any treatments for these infections
19
20 78 [20]. The implementation of education, universal precautions, elimination of needle
21
22 79 recapping, and use of sharp containers for safe disposal have reduced the chance of
23
24 80 getting sharp injuries by 80% [6, 21].
25
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29 81 Health care providers who followed universal precautions were 66% less likely to have
30
31 82 needle sticks and sharp injuries than those who did not follow [22]. Training of handling
32
33 83 objects, using instruments to grasp needles, reduction of the use of sharp devices,
34
35 84 avoiding hand-to-hand passing of sharp instruments, decreasing of direct contact with
36
37 85 needles, an appropriate disposal and using safety boxes properly can decrease the risk
38
39 86 of getting sharp injuries [23].
40
41
42

43 87 In Ethiopia, where primary health care services are covered by nurses, it is important to
44
45 88 develop their knowledge and practice on universal precautions since the risks of getting
46
47 89 infections following sharp injuries are high in their day to day activities [4]. However, there
48
49 90 is limited information in the study area that describes the magnitude of sharp injuries and
50
51 91 its predictors among nurses. Therefore, this study aimed to determine the magnitude of
52
53 92 occupational exposure to sharp injuries and identify its associated factors.
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57

93 **General objective**

94 To assess the magnitude of occupational exposure to sharp injuries among nurses
95 working in South Gondar zone public hospitals, Northcentral Ethiopia from November 01-
96 30, 2022

97 **Specific objectives**

98 To determine the magnitude of occupational exposure to sharp injuries among nurses
99 working in South Gondar zone public hospitals, Northcentral Ethiopia from November 01-
100 30, 2022.

101 To identify the predictors of occupational exposure to sharp injuries among nurses
102 working in South Gondar zone public hospitals, Northcentral Ethiopia from November 01-
103 30, 2022.

104 **METHODS**

105 **Study design, area and Period**

106 Institution-based cross-sectional study design was conducted among nurses working in
107 South Gondar zone public hospitals from November 01-30, 2022. South Gondar is one
108 of the zonal administrations in Amhara region, Northern Ethiopia with an estimated area
109 of 14,095.19 square kilometers. It is located by South and North Wollo zones in the East,
110 Bahirdar Liyu zone and Lake Tana in the West, Central Gondar in the North, Waghimra
111 zone in the Northeast and East and West Gojjam zones in the South (Figure 1). There
112 are ten public hospitals in the zone, namely Debre Tabor comprehensive specialized
113 hospital, Addis Zemen, Ebnat, Mekane-Eyesus, Andabet, Wogeda, Woreta, Nefas
114 Mewucha, Dr. Ambachew Makonnen and Migbaru Kebede primary hospitals.

115 **Source Population**

1
2
3 116 All nurses working in all South Gondar zone public hospitals.
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5
6 117 **Study Population**
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8 118 All nurses working in all South Gondar zone public hospitals.
9

10
11 119 **Inclusion and exclusion criteria**
12

13 120 All nurses working in all South Gondar zone public hospitals at the time of the data
14
15 121 collection period were included in the study; whereas nurses who were on sick leave,
16
17 122 maternity leave, annual leave, and training at the time of data collection period were
18
19 123 excluded from the study.
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21

22
23 124 **Patient and public involvement**
24

25 125 Patients and/or the public were not involved in the design, or conduct, or reporting, or
26
27 126 dissemination plans of the research.
28

29
30 127 **Sample size determination**
31

32 128 The sample size (n) was calculated by Computer-based Epi info7 software using a single
33
34 129 population proportion at 95% CI, with a 5% margin of error, and by assuming the burden
35
36 130 of occupational exposure to sharp injuries among nurses to be 61.76% [3].
37
38

$$39 \quad n = \frac{(Z_{\alpha/2})^2 P (1-P)}{40 \quad d^2}$$

41 132
42 133 *Where:* - n= the minimum sample size required for the study

43
44 134 Z= standard normal distribution (Z=1.96) with a 95% confidence interval

45
46 135 P= burden of occupational exposure to sharp injuries among nurses

47
48 136 (61.76%=0.6176)

49
50 137 d= is a tolerable margin of error (d=5%=0.05)

$$51 \quad n = \frac{(1.96)^2 0.6176(1-0.6176)}{52 \quad d^2}$$

1
2
3 139 (0.05)²
4

5 140 n=363. Then, by adding a 10% (0.1) non-response rate, the final sample size (n)
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7
8 141 was calculated to be 400. But, since it was the minimum sample size required, and the
9
10 142 source population was only 402, the source population (402) was taken as a sample size
11
12 143 for this study (census method was used).
13

14 144 **Dependent Variable**

15 145 Occupational exposure to sharp injuries
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19 146 **Independent variables**

20 147 Socio-demographic characteristics: Age, sex, marital status, level of education and years
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22
23 148 of service.
24

25 149 Behavioral characteristics: Sleeping disturbance, following of standard precaution guide
26
27 150 line, use of PPE, knowledge of standard precautions and job-related stress.
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29 151 Work environment characteristics: Length of stay/shift, health and safety information
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32 152 access, infection prevention training, work load, availability of safety box, availability of
33
34 153 standard precaution guidelines and presence of contaminated sharps.
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38 154 **Operational Definitions**

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41 155 **Occupational exposure to sharp injuries:** Any kind of needle stick and/or other sharp
42
43 156 injury which occurred among nurses in relation to his/her job in the health care facility [4].
44

45 157 **Knowledge:** Nurses who have scored $\geq 75\%$ (9) of 12 knowledge-related questions were
46
47
48 158 considered to have adequate knowledge; whereas nurses who have scored below 75%
49
50 159 were also considered to have inadequate knowledge towards sharp injuries [24].
51

52 160 **Job-related stress:** Nurses who scored above or equal to the mean score (32.78) of the
53
54
55 161 Likert-scale questions that used to assess nurses' job-related stress were considered
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3 162 they have a job-related stress, whereas nurses who scored below the mean score were
4
5 163 also considered they didn't have job-related stress [25].
6

7
8 164 **Workload:** When one trained intensive care unit (ICU) nurse provides nursing care
9
10 165 services for more than two patients in the ICU, and when one nurse provides nursing care
11
12 166 services for more than 6 patients in inpatient departments per shift [25].
13

14
15 167 **Sleeping disturbance:** The presence of sleeping problems while the health care provider
16
17 168 is at workplace [25].
18

19 169 **Data collection tool and procedure**

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21
22 170 A structured and pre-tested self-administered English version questionnaire was used to
23
24 171 collect the data. The questionnaire was prepared by reviewing different literatures [3, 4,
25
26 172 25], and using standardized Expanded Nursing Stress Scale (ENSS) Likert-scale
27
28 173 questions to assess job-related stress of the respondents [3, 4, 25].
29

30
31 174 The questionnaire contains nurses' socio-demographic, behavioral, environmental
32
33 175 characteristics, knowledge questions related to standard precaution and standardized
34
35 176 Likert-scale questions to assess job-related stress of the respondents. Reliability of the
36
37 177 tool was established with an overall Cronbach's alpha score (0.74 for knowledge
38
39 178 questions related to standard precaution, and 0.79 for job-related stress Likert-scale
40
41 179 questions). Training was given to the data collectors, and before giving the questionnaire,
42
43 180 the data collectors informed the nurses about the aims/purposes, risks and possible
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45 181 benefits of the study, the right and refusal to participate in the study, and that the collected
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47 182 information would be kept confidential.
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3 183 After all, those nurses who were willing and have signed the informed voluntary consent
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5 184 form were requested to fill out the questionnaire. The data collection was held for four
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7
8 185 consecutive weeks (from November 01-30/2022).
9

10 186 **Data quality control**

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12 187 Five percent of the questionnaire was pre-tested from October 23-27/2022 in Koladiba
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14
15 188 primary hospital to assess the reliability, clarity, consistency, understandability and the
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17 189 total time that it would take to complete the questionnaire prior to the actual data
18
19
20 190 collection. Then, the necessary comments and feedback were incorporated in the final
21
22 191 tool to improve its quality. Training was given for the data collectors regarding the
23
24 192 objective of the study, data collection tool, ways of data collection, checking the
25
26 193 completeness of the collected data, and how to maintain confidentiality.
27

28
29 194 The collected data were checked for completeness, cleaned, edited, coded manually, and
30
31 195 entered into Epi data version 4.2. Double data entry was done for its validity, and
32
33 196 compared to the original data. Outliers were checked, and simple frequencies and cross
34
35
36 197 tabulation were done for missing values and variables.
37

38 198 **Data processing and analysis**

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41 199 Then after, the data were exported to Stata version 14 for analysis. Descriptive analysis
42
43 200 was done by computing proportions and summary statistics. The information was
44
45 201 presented using simple frequencies, summary measures, tables, and figures. Binary
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48 202 logistic regression was used to identify the associated factors of occupational exposure
49
50 203 to sharp injuries. Bivariate and multivariate analyses were used to see the association
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52 204 between the outcome variable, and each independent variable. The assumptions for
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205 binary logistic regression were checked. The goodness of fit was tested by Hosmer-
 206 Lemeshow statistics and Omnibus tests.

207 All variables with $P < 0.2$ in the bivariate analysis were included in the final multivariable
 208 analysis model in order to control all the possible confounders, and the variables were
 209 selected using enter method. The adjusted odds ratio (AOR) along with a 95% CI was
 210 estimated to identify the associated factors of occupational exposure to sharp injuries. In
 211 this study, variables with a P-value of < 0.05 were considered significantly associated with
 212 occupational exposure to sharp injuries.

213 RESULTS

214 Of the total of 402 respondents, 376 were included in the final analysis, giving a response
 215 rate of 93.53%.

216 Socio-demographic and working environment related attributes

217 Of the total respondents, 213 (56.65%) were between the age of 25-34 with the mean \pm
 218 SD of age 30.22 ± 6.63 years. Similarly, 202 (53.72%) of the respondents were females.
 219 Additionally, only 89 (23.67%) of the respondents got infection prevention training.
 220 Moreover, 271 (72.07%) of them had safety boxes at workplace to dispose needles and
 221 other sharp materials after use, and 214 (56.91%) of respondents also stated that there
 222 were contaminated needles and sharp materials at workplace (Table 1).

225 Table 1: Socio-demographic characteristics of the respondents working in South Gondar
 226 zone public hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Category	Frequency	Percentage (%)
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Age	≤24	68	18.09
	25-34	213	56.65
	35-44	71	18.88
	≥45	24	6.38
Sex	Male	174	46.28
	Female	202	53.72
Marital status	Single	171	45.48
	Married	183	48.67
	Divorced	17	4.52
	Widowed	5	1.33
Educational level	Diploma	132	35.11
	BSc	244	64.89
Years of service	<5	136	36.17
	5-10	128	34.04
	>10	112	29.79
Sleeping disturbance problem	Yes	274	72.87
	No	102	27.13
Use of PPEs	All of the time	185	49.20
	Most of the time	102	27.13
	Sometimes	73	19.41
	Never use	16	4.26
Workload in the unit	Yes	212	56.38
	No	164	43.62
Length of stay/shift at work	≤8 hours	193	51.33
	9-14 hours	35	9.31
	≥15 hours	148	39.36
Health and safety information access	Yes	291	77.39
	No	85	22.61
Training on IP	Yes	89	23.67
	No	287	76.33

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Availab. of safety box at workplace	Yes	271	72.07
	No	105	27.93
Availab. of universal precaution guide line	Yes	212	56.38
	No	164	43.62
Following universal precaution guide line	Yes	93	43.87
	No	119	56.13
Presence of contaminated sharps at workplace	Yes	214	56.91
	No	162	43.09
Knowledge of standard precaution	Adequate knowledge	134	35.64
	Inadequate knowledge	242	64.36
Job-related stress	Stressed	237	63.03
	Not stressed	139	36.97

227 *BSc, Bachelor of Science; *IP, infection prevention; PPEs, personal protective
228 equipments

229 **Magnitude of occupational exposure to sharp injuries**

230 This study finding showed that the magnitude of occupational exposure to sharp injuries
231 among nurses was 52.39% (95%CI: 47.92%, 56.37%) (197).

232 The occurrence of occupational exposure to sharp injuries was the highest among
233 respondents with the age of 45 years and above (62.50). Likewise, the majority of males,
234 108(62.07) also got occupational exposure to sharp injuries. Occupational exposure to
235 sharp injuries was also the highest among diploma nurses, and nurses having more than
236 10 years of service (59.85% and 62.50%) respectively. Moreover, the occurrence of sharp
237 injuries was also the highest among nurses working along with the presence of
238 contaminated sharps at workplace (63.55%) (Table 2).

239 Table 2: Distribution of sharp injuries among nurses working in South Gondar zone public
240 hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Occupational exposure to sharp injuries
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		Yes (%)	No (%)
Age	≤24	32(47.06)	36(52.94)
	25-34	111(52.11)	102(47.89)
	35-44	39(54.93)	32(45.07)
	≥45	15(62.50)	9(37.50)
Sex	Male	108(62.07)	66(37.93)
	Female	89(44.06)	113(55.94)
Marital status	Single	87(50.88)	84(49.12)
	Married	96(52.46)	87(47.54)
	Divorced	11(64.71)	6(32.29)
	Widowed	3(60.0)	2(40.0)
Educational level	Diploma	79(59.85)	53(40.15)
	BSc	118(48.36)	126(51.64)
Year of service	<5	59(43.38)	77(56.62)
	5-10	68(53.13)	60(46.87)
	>10	70(62.50)	42(37.50)
Sleeping disturbance problem	Yes	141(51.46)	133(48.54)
	No	56(54.90)	46(45.10)
Use of PPEs	All of the time	89(48.11)	96(51.89)
	Most of the time	56(54.90)	46(45.10)
	Sometimes	41(56.16)	32(43.84)
	Never use	11(58.75)	5(31.25)
Workload	Yes	125(58.96)	87(41.04)
	No	72(43.90)	92(56.10)
Length of stay/shift at work	≤8 hours	95(49.22)	98(50.78)
	9-14 hours	19(54.29)	16(45.71)
	≥15 hours	83(56.08)	65(43.92)
Health & safety information access	Yes	148(50.86)	143(49.14)
	No	49(57.65)	36(42.35)
Training on IP	Yes	38(42.70)	51(57.30)
	No	159(55.40)	128(44.60)

Availab. of safety box	Yes	129(47.60)	142(52.40)
	No	68(64.76)	37(35.24)
Availab. of universal precaution guide line	Yes	99(46.70)	113(53.30)
	No	98(59.76)	66(40.24)
Following universal precaution guide line	Yes	42 (45.16)	51(54.84)
	No	155 (54.77)	128 (45.23)
Presence of contaminated sharps at workplace	Yes	136(63.55)	78(36.45)
	No	61(37.65)	101(62.35)
Knowledge of standard precaution	Adequate knowledge	59(44.03)	75(55.97)
	Inadequate knowledge	138(57.02)	104(42.98)
Job-related stress	Stressed	149(62.87)	88(37.13)
	Not stressed	48(34.53)	91(65.47)

241 *BSc, Bachelor of Science; PPEs, personal protective equipments; and IP, infection
242 prevention

243 Occupational exposure to sharp injuries related Attributes

244 Of the respondents who encountered occupational exposure to sharp injuries,
245 114(57.87%) had encountered sharp injuries 1-2 times. Additionally, 69 (35.03%) of
246 injuries occurred during abrupt movement of patients, and 86(43.65%) sharp injuries were
247 slight skin penetration. Moreover, 93 (47.21%) of injuries were from the unknown status,
248 and only 92 (46.70%) sharp injuries were reported to the concerned body (Table 3).

249 Table 3: Occupational exposure to sharp injuries related attributes among nurses working
250 in South Gondar zone public hospitals, Northcentral Ethiopia, 2022 (n=376).

Variables	Values	Frequency	Percentage (%)
Frequency of injuries occurred	1-2 times	114	57.87
	3-4 times	71	36.04
	≥5 times	12	6.09
Condition of sharps	Dirty needles/sharps	74	37.56
	Sterile needles/sharps	58	29.45

	Both dirty & sterile needles/sharps	65	32.99
How sustaining injuries	During abrupt movement of patients	69	35.03
	During recapping needle after use	63	31.98
	During sharp collection	46	23.35
	Others	19	9.64
Type of injuries sustained	Deep injury	54	27.41
	Slight skin penetration	86	43.65
	Superficial injury	57	28.94
Health status of the source patients	Known HIV/AIDS positive	37	18.78
	Clinically suspected HIV/AIDS	40	20.30
	Clinically diagnosed hepatitis B patient	27	13.17
	Unknown status	93	47.21
Report of the injuries	Yes	92	46.70
	No	105	53.30

251 *HIV/AIDS, Human immune deficiency virus/Acquired immune deficiency syndrome

252 **Distribution of sharp injuries by their type**

253 The types of sharps that cause injuries to nurses were intravenous needles, 64(32.49%),
 254 intramuscular needles, 42(21.32%), suturing needles, 36(18.27%), lancets, 29 (14.72%),
 255 surgical blades, 17 (8.63%) and scalpels, 9 (4.57%).

256 **Factors associated with occupational exposure to sharp injuries**

257 Nurses having above 10 years of service were 2.35 times more likely to encounter
 258 occupational exposure to sharp injuries than nurses having less than 5 years of service
 259 (AOR=2.35, 95%CI: 1.21,4.57). On the other hand, nurses who didn't get infection
 260 prevention training were 1.85 times more likely to encounter occupational exposure to
 261 sharp injuries (AOR=1.85, 95%CI: 1.09, 3.45). Additionally, nurses having job-related

262 stress were also 2.24 times more likely to be exposed for sharp injuries (AOR=2.24,
 263 95%CI: 1.27, 3.89), and nurses who were working in the area with the presence of
 264 contaminated sharps were 2.76 times more likely to get the chance of occupational
 265 exposure to sharp injuries (AOR=2.76, 95%CI: 1.67, 4.72) (Table 4).

266 Table 4: Showing the association between independent variables with occupational
 267 exposure to sharp injuries among nurses working in South Gondar zone public hospitals,
 268 Northcentral Ethiopia, 2022 (n=376).

Variables	Categories	Sharp injuries		COR (95%CI)	AOR (95%CI)
		Yes (%)	No (%)		
Sex	Male	108 (54.82)	66 (36.87)	2.15 (1.32,3.07)	1.98 (0.91,4.21)
	Female	89 (45.18)	113 (63.13)	1.00	1.00
Year of service	<5	59 (29.95)	77 (43.02)	1.00	1.00
	5-10	68 (34.52)	60 (33.52)	1.46 (0.87,2.42)	1.38 (0.72,2.64)
	>10	70 (35.53)	42 (23.46)	2.12 (1.26,3.49)	2.35 (1.21,4.57) ***
Workload in the unit	Yes	125 (63.45)	87 (48.60)	1.73 (1.15,2.52)	1.42 (0.83,2.45)
	No	72 (36.55)	92 (51.40)	1.00	1.00
Training	Yes	38 (19.29)	51 (28.49)	1.00	1.00
	No	159 (80.71)	128 (71.51)	2.08 (1.49, 3.13)	1.85(1.09, 3.45) ****
Nurses' knowledge of standard precaution	Adequate knowledge	59 (29.95)	75 (41.90)	1.00	1.00
	Inadequate knowledge	138 (70.05)	104 (58.10)	1.96 (1.31,2.94)	1.42 (0.79,2.39)
Nurses' job stress level	Stressed	149 (75.63)	88 (49.16)	2.45 (1.62,3.67)	2.24 (1.27,3.89) **
	Not stressed	48 (24.37)	91 (50.84)	1.00	1.00
Presence of contaminated sharps	Yes	136 (69.04)	78 (43.58)	2.71 (1.79,4.09)	2.76 (1.67,4.72) *
	No	61 (30.96)	101 (56.42)	1.00	1.00

269 *Significant at P=0.000, **Significant at P=0.005, ***Significant at P=0.011, and
 270 ****Significant at P=0.018.

271 DISCUSSION

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3 272 This study finding showed that the magnitude of occupational exposure to sharp injuries
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5 273 among nurses was 52.39%. This study finding also reported that years of service >10
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7 274 years, lack of infection prevention training, job-related stress, and the presence of
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9 275 contaminated sharps at workplace were significantly associated with the occurrence of
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11 276 occupational exposure to sharp injuries among nurses.

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14 277 In this study, the magnitude of occupational exposure to sharp injuries among nurses was
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16 278 52.39%. This finding was higher than a study conducted in three hospitals, Izmir, Turkey
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18 279 (44.3%) [18], but lower than studies conducted in Public Sector Tertiary Care Hospitals
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20 280 of Pakistan (67%) [26], and JUSH, Southwest Ethiopia (61.76%) [3]. This variation might
21
22 281 be due to the difference in study setting and period, as well as due to the difference in
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24 282 infection prevention training and knowledge level of the respondents towards standard
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26 283 precaution across study settings.

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31 284 In this study, year of service >10 years was significantly associated with the occurrence
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33 285 of occupational exposure to sharp injuries among nurses at $p < 0.05$. This finding was
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35 286 similar with studies conducted in three hospitals, Izmir, Turkey [18], and a secondary
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37 287 care hospital, Gaza Strip [27], which showed that year of service had shown significant
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39 288 association with the occurrence of occupational exposure to sharp injuries among nurses
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41 289 at $p < 0.05$. It might be due to the fact that as year of service increases, the chance of
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43 290 getting occupational exposure to sharp injuries also increases.

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46 291 This study finding also indicated that nurses who didn't get infection prevention training
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48 292 were 1.85 times more likely to get the chance of occupational exposure to sharp injuries
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50 293 compared to nurses who got the training. This finding was in line with a study conducted
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52 294 in public hospitals of Jimma Zone, South West Ethiopia [4], which showed that nurses
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3 295 who didn't get infection prevention training were 8.33 times more likely to get the chance
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5 296 of occupational exposure to sharp injuries compared to nurses who got the training. It is
6
7 297 due to the fact that getting infection prevention training helps to understand and practice
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9 298 the standard precaution guide line easily, which in turn reduces the chance of getting
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11 299 occupational exposure to sharp injuries.

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14 300 Similarly, this study finding also showed that job-related stress was significantly
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16 301 associated with the occurrence of occupational exposure to sharp injuries among nurses.
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18 302 This finding was comparable with a study conducted in JUSH, Southwest Ethiopia which
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20 303 reported that job-related stress had shown significant association with the occurrence of
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22 304 occupational exposure to sharp injuries among nurses [14]. It could be explained that job-
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24 305 related stress might make nurses to lose their concentration and practice their daily
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26 306 activities unsafely.

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29 307 Moreover, this study finding also showed that the presence of contaminated needles and
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31 308 sharp materials at workplace was also significantly associated with the occurrence of
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33 309 occupational exposure to sharp injuries among nurses at $P < 0.05$. This finding was
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35 310 congruent with a study conducted in JUSH, Southwest Ethiopia which reported that the
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37 311 presence of contaminated needles and sharp materials at the workplace was significantly
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39 312 associated with the occurrence of occupational exposure to sharp injuries among nurses
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41 313 at $p < 0.05$ [3]. The presence of contaminated needles and sharp materials at workplace
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43 314 increases the chance of getting occupational exposure to sharp injuries among nurses in
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45 315 their day-to-day workplace activities.

316 **Strengths and limitations of this study**

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3 317 The study used census method, as a result, the findings could be strong evidence for the
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5 318 problem. However, the study might be subjected to recall and social desirability biases.
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7 319 The study also might not show cause and effect relationships while the study design was
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9 320 cross sectional.

321 **CONCLUSIONS**

322 Generally, this study finding reported that the magnitude of occupational exposure to
323 sharp injuries among nurses was high. Moreover, this study finding also showed that
324 years of service >10 years, lack of infection prevention training, job-related stress, and
325 the presence of contaminated sharps at workplace were independent predictors of
326 occupational exposure to sharp injuries among nurses.

327 **Prevention and control strategies**

328 Continually educate the health care team: To achieve the desired infection prevention
329 and control goals, training on infection prevention and control should be given to the staff
330 on a continual basis covering the standard infection prevention and control precautions.

331 Conducting regular clinical audits: It used to ensure best practice of the standard infection
332 prevention and control precautions such as proper use of personal protective equipment,
333 disposal of used needles and other sharps and hand hygiene.

334 Creating a cleanliness culture: By building a clean culture, staff are aware of the benefits
335 of infection prevention and control.

336 **Recommendations**

337 All the concerned bodies should strengthen regular provision of infection prevention
338 training to the nurses at all levels. Stakeholders, including nursing staffs should also
339 strengthen their efforts to work together to identify and manage the possible job-related

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3 340 stressors among nurses. Furthermore, safety boxes should be available in each working
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5 341 unit, and nurses should also practice proper use of safety box more than ever in order to
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7 342 avoid the presence of contaminated needles and other sharp materials at workplace.
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10 343 **Abbreviations and acronyms**

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13 344 AIDS: Acquired Immune Deficiency Syndrome

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15 345 AOR: Adjusted Odds Ratio

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17 346 CI: Confidence Interval

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19 347 EBN: European Biosafety Network

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21 348 ENSS: Expanded Nursing Stress Scale

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23 349 HBV: Hepatitis B Virus

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25 350 HCV: Hepatitis C Virus

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27 351 HIV: Human Immune deficiency Virus

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29 352 ICU: Intensive Care Unit

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31 353 PPEs: Personal Protective Equipments

32 354 **Consent for Publication**

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34 355 Not applicable.

35 356 **Funding**

36
37 357 Not applicable.

38 358 **Data availability**

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40 359 All data used for the study were included in the manuscript.

41 360 **Competing interests**

42
43 361 We declared that we have no any conflicts of interests.

44 362 **Patient consent for publication**

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3 363 Consent was obtained from the respondents.
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5 364 **Ethical approval**

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8 365 The study involved human participants and was approved by Debre Tabor University,
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10 366 College of Health Sciences, ethical review board (Ref No.CHS/048/2022). All the
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12 367 respondents were informed about the purpose of the study, their right to refuse, and
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14 368 written and signed voluntary consent was obtained from all the respondents prior to data
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16 369 collection. The respondents were told that the information obtained from them would be
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18 370 treated with complete confidentiality, and would not cause any harm to them.
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21 371 **Provenance and peer review**

22
23 372 Not commissioned; externally reviewed.
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26 373 **Author Contribution**

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28 374 TM conceptualized the study and was involved in the design, analysis, interpretation,
29
30 375 report, and manuscript writing. TM and YT made a substantial contribution to the
31
32 376 conception, analysis, and interpretation of data. SD contribute to critical revision of the
33
34 377 manuscript. All the authors read and approved the final manuscript.
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50 383 study.
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10 478 **Figure 1:** Map of South Gondar Zone (Source; Ethio GIS, 1994).
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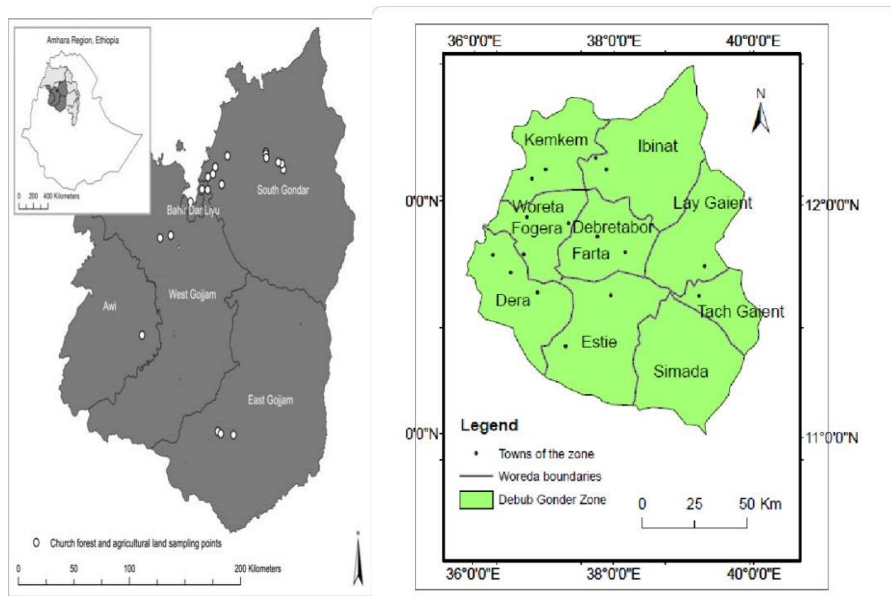


Figure 1: Map of South Gondar Zone (Source; Ethio GIS, 1994)

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

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			Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	1-3
Objectives	#3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	#4	Present key elements of study design early in the paper	4
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4

1	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	5
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4		#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give	5-6
5			diagnostic criteria, if applicable	
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8	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment (measurement).	6-7
9	measurement		Describe comparability of assessment methods if there is more than one group. Give information separately	
10			for for exposed and unexposed groups if applicable.	
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14	Bias	#9	Describe any efforts to address potential sources of bias	7
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17	Study size	#10	Explain how the study size was arrived at	5
18				
19	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings	7-8
20	variables		were chosen, and why	
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24	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	7-8
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27	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	7-8
28				
29	Statistical methods	#12c	Explain how missing data were addressed	7-8
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32	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	7-8
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34	Statistical methods	#12e	Describe any sensitivity analyses	7-8
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37	Results			
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40	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for	9
41			eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	
42			separately for for exposed and unexposed groups if applicable.	
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46	Participants	#13b	Give reasons for non-participation at each stage	9
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49	Participants	#13c	Consider use of a flow diagram	10
50				
51	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures	10
52			and potential confounders. Give information separately for exposed and unexposed groups if applicable.	
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56	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	10
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1	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and	10-12
2			unexposed groups if applicable.	
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5	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95%	13-14
6			confidence interval). Make clear which confounders were adjusted for and why they were included	
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10	Main results	#16b	Report category boundaries when continuous variables were categorized	13-14
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12	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	13-14
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15	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	13-14
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18	Discussion			
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20	Key results	#18	Summarise key results with reference to study objectives	13-14
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23	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both	17
24			direction and magnitude of any potential bias.	
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27	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from	14-17
28			similar studies, and other relevant evidence.	
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32	Generalisability	#21	Discuss the generalisability (external validity) of the study results	17
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34	Other Information			
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37	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original	18
38			study on which the present article is based	
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