

Original Article

Prevention of hearing loss among marble industrial workers: outcome of educational intervention on awareness

Nagda S¹, Chaturvedi D², Saranya S³, Yadav KS⁴, Paliwal C⁵, Paliwal H⁶

¹ Associate Professor, Tirupati College of Nursing, Udaipur, Rajasthan, India

² PhD Nursing Scholar, Sai Tirupati University, Udaipur, Rajasthan, India,

³ Assistant Professor, Tanishq College of Nursing, Nagpur, Maharashtra, India

⁴ Assistant Professor, Arihant College of Nursing, Indore, Madhya Pradesh, India

⁵ Assistant Professor, Tirupati College of Nursing, Udaipur, Rajasthan, India

⁶ Associate Professor, Saraswati College of Nursing, Udaipur, Rajasthan, India

Corresponding author:

Chaturvedi Dharmesh,

PhD Nursing Scholar,

Sai Tirupati University, Udaipur,
Rajasthan, India

E-mail:

dharmeshchaturvedi@gmail.com

Tel.: +919428549783

ORCID ID: <https://orcid.org/0000-0001-6723-6577>

Date of submission: 31.07.2024

Date of acceptance: 16.03.2025

Date of publication: 01.04.2025

Conflicts of interest: None

Supporting agencies: None

DOI: <https://doi.org/10.3126/ijosh.v15i2.64633>



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ABSTRACT

Introduction: There is a high prevalence of hearing loss among marble and stone industry workers. Noise is the most pernicious industrial contaminant, affecting every industry and resulting in significant hearing loss worldwide. The objective of the study was to assess the effectiveness of a self-instructional module on knowledge regarding the prevention of hearing loss among marble industrial workers in selected marble industries.

Methods: A total of 120 marble industrial workers were selected using a purposive sampling technique under a pre-experimental research design (one group pre-test and post-test). The research setting was selected marble industries in Udaipur, Rajasthan. The instruments used for the study were knowledge questionnaires.

Results: The study revealed that the mean post-test knowledge score (23.59) was greater than the mean pre-test score (7.26). In addition, the mean difference between the pre-test and post-test scores was 16.33. The paired t-test knowledge score of 36.24 is significant at the 0.05% level. This indicates that the educational intervention was effective in increasing the knowledge level regarding the prevention of hearing loss among marble industry workers.

Conclusion: Knowledge improved after educational intervention. Knowledge level was not associated with demographic variables of the participants. The study suggests that periodical educational intervention is much needed to prevent hearing loss among marble industry workers.

Keywords: Effectiveness, Educational intervention, Hearing loss, Industry, Knowledge, Marble, Prevention, Worker.

Introduction

Loss of hearing occurs when the sensitivity to regularly heard noises is lowered. The terms hearing impairment or hard of hearing are typically used when referring to someone with a relative insensitivity to sound in speech frequencies. The amount of noise over normal required before the listener can detect a hearing loss is used to categorize the severity of a hearing loss.¹

The most pernicious industrial contaminant, noise, affects every industry and results in significant hearing loss throughout the world. A partial or whole hearing loss in one or both ears due to one's employment is called occupational hearing loss (OHL), which also encompasses noise-induced hearing loss (NIHL) and acoustic traumatic injury.² In order to address their incapacitating hearing loss, more than 5% of the

world's population needs rehabilitation. One in ten individuals will reportedly have a debilitating hearing loss by the year 2050. People with debilitating hearing loss make up over 80% of the population in low- and middle-income nations. As people get older, hearing loss is more common.³ The study titled "Impact of noise on hearing acuity of marble factory workers" revealed that 46.7% of participants had noise-induced hearing loss (NIHL) compatible with the audiogram. Hearing impairment drastically increased with age and the extent of exposure to occupational noise.⁴ A cross-sectional study indicated that 2.8% of the controls and 21.5% of the stone crushing industry personnel had subjective hearing loss. About 19.3% of stone crushing workers had early NIHL in the left ear, and 14.3% in the right ear.⁵ A study on noise-induced hearing loss (NHIL) among industrial workers of South Punjab, Pakistan, found 30.06% of participants with NHIL.⁶ A study conducted in Kolkata (India) found that 34.90% of employees who were deaf were exposed above the permissible occupational noise level, while there was 6.98% deafness in non-exposed workers.⁷ According to a Noise Induced Hearing Loss study, 57.8% of participants perceived their work area as noisy but not harmful. Only 21.7% of participants had a satisfactory level of knowledge.⁸ A descriptive study found that an overall mean percent score of 55.6% was obtained in the knowledge domain, which indicated that participants had inadequate knowledge regarding certain aspects of NIHL.⁹ An interventional study revealed that workers receiving the tailored intervention significantly increased their use of hearing protection devices from pretest to posttest.¹⁰ Objective of the study was to evaluate the level of knowledge among marble industrial workers regarding the prevention of hearing loss.

Methods

A pre-experimental one-group pretest-posttest research design using a quantitative approach was utilized to conduct the study. The sample size was calculated by using the Z statistic

formula. $Z_{\alpha} = 1.96$ (Standard normal deviate for α). $Z_{\beta} = 0.84$ (Standard normal deviate for β). $B = (Z_{\alpha} + Z_{\beta})^2 = 7.8489$. $C = (E/S_{\Delta})^2 = 0.0729$. (E effect size calculated on the previous review of literature that was 0.54, and S_{Δ} = Standard Deviation of the CHANGE in the outcome was kept at 2.0). $N = B/C = 107.6663$. (Sample size (N)).³² Considering the drop factor, 120 workers of the marble industry were included as samples by employing the Purposive sampling technique from the industrial area of Sukher, Udaipur, Rajasthan, India. The data collection period was two months from 14th April 2015 to May 1st 2015. The research tool comprises two parts-Part I: consists of socio-demographic data such as age in years, gender, educational qualification, monthly income, work experience, and safety seminars attended regarding hearing loss. Part II consists of 26 knowledge items. Each item was MCQ's in nature with four choices. A self-instructional module was utilized as an educational intervention. It consists of introduction, types, epidemiology, people at risk, causes, risk factors, signs and symptoms, diagnosis, and prevention of hearing loss. Before tool administration, all subjects were given an information sheet explaining the purpose and outcome of the study. Permission was obtained from the manager of Shree Ganpati Tiles Private Limited and Samar Marbles and Granites Industry of Udaipur. Consent was taken from each participant of the study. Ethical committee permission was taken from Geetanjali College of Nursing via Ref No. GCN/2015/11. Confidentiality of the respondents was assured with the statement that their responses would be utilized only for research work. The obtained data were analyzed by using descriptive and inferential statistics. Paired t-test and Chi-square test were used for hypothesis testing at a .05 significance level. The knowledge of marble workers regarding prevention of hearing loss was scored as inadequate knowledge (0-50%), moderately adequate knowledge (>50% & <75%), and adequate knowledge (>75%) of the total score.

Results

Table 1 depicts that the majority of the participants, 82 (68.33%), are 18 to 25 years old. All participants (100%) were male. The majority of the participants, 59 (49.17%), had primary education. Regarding monthly income, 61

(50.84%) participants had a monthly income between 5000 and 10000 Rs. In view of the work experience of participants, 54 (45%) had 2 to 4 years of experience. Almost all participants (100%) had not attended any safety seminar on hearing loss.

Table 1. Distribution of socio-demographic characteristics of the participants (N=120)

Variable	Category	Frequency (Percentage)
Age in year	18-25	82 (68.33%)
	26-30	24 (20%)
	31-35	12 (10%)
	Above 35	02 (1.67%)
Gender	Male	120 (100%)
	Female	00
Education	Non formal	05 (4.17%)
	Primary	59 (49.17%)
	Secondary	31 (25.83%)
	Senior Secondary	10 (8.33%)
	Graduation	15 (12.50%)
Monthly income in Rs.	5000-10000	61 (50.83%)
	10001-15000	34 (28.33%)
	15001-20000	16 (13.33%)
	Above 20001	09 (7.50%)
Work experience in year	0-2	52 (43.33%)
	2-4	54 (45%)
	4-6	12 (10%)
	Above 6	2 (1.67%)
Attended safety seminar regarding hearing loss	Yes	00
	No	120 (100%)

According to Figure 1, in the pre-test, 95.83% of participants had an inadequate knowledge level, and 4.17% had a moderately adequate knowledge level. In the post-test, 95% of participants had an

adequate knowledge level, and 5% had a moderately adequate knowledge level regarding the prevention of hearing loss.

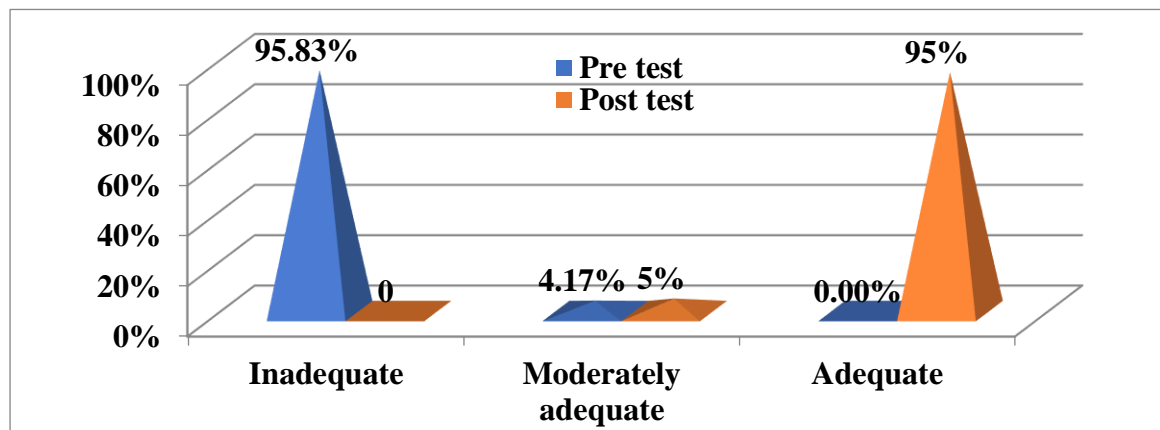


Figure 1: Percentage distribution of pre test and post test level of knowledge among participants.

As per table 2, in pre-test the maximum mean percentage score obtained by the participants was 35.35% with SD of 1.44 in the domain of prevention and complications of hearing loss while minimum mean percentage score obtained by the participants was 22.76% with SD 0.44 in the domain of introduction to hearing loss. In post test the maximum mean percentage score obtained by the participants was 99.66% with SD of 1.02 in the domain of anatomy and physiology of ear while minimum mean percentage score obtained by the participants was 84.12% with SD

0.41 in the domain of sign, symptoms and diagnosis of hearing loss.

Mean post-test knowledge score 23.59 (90.73%) was greater than the mean pre-test knowledge score 7.26 (27.92%). This also depicted 16.33 (62.81%) enhancement in the knowledge level of the participants. The difference was significant as 't' values 36.21 was higher than table value (1.96) ($p=0.001$). This indicated that the educational intervention was effective in improving the knowledge score regarding prevention of hearing loss.

Table 2. Domain wise pretest and post knowledge score of participants regarding prevention of hearing loss among marble industrial worker:

Domain	Max score	Pre test			Post test			Mean Diff.
		Mean	Mean%	SD	Mean	Mean%	SD	
Anatomy and physiology of ear	3	0.75	25.26%	0.26	2.99	99.66%	1.02	2.24
Introduction of hearing loss	3	0.68	22.76%	0.44	2.57	85.83%	0.87	1.89
Causes and risk factors of hearing loss	5	1.15	23.16%	0.78	4.25	85%	0.59	3.10
Sign, symptom and diagnosis of hearing loss	8	2.19	27.37%	0.48	6.73	84.12%	0.41	4.54
Prevention, and complication of hearing loss	7	2.47	35.35%	1.44	6.94	99.14%	1.26	4.47
Total	26	7.26	27.92%	2.12	23.59	90.73%	2.09	16.33 ($p=0.001$)

As per table 3, socio demographic variables of the participants like age, education, monthly income and work experience were not significantly

associated with the pre test knowledge scores of the participants regarding prevention of hearing loss.

Table 3. Association between pre test knowledge scores of participants with socio demographic variables

N=120					
Variable	Below median	Above median	Total	χ^2	P Value
1.Age in years					
18-25	46	36	82	0.911	0.82
26-30	16	08	24		
31-35	07	05	12		
Above 35	01	01	02		
2.Education					
Non formal	05	00	05	4.18	0.38
Primary	34	25	59		
Secondary	16	15	31		
Senior Secondary	06	04	10		
Graduation	09	06	15		
3. Monthly Income in Rs.					
5000-10000	34	27	61	2.11	0.54
10001-15000	19	15	34		
15001-20000	12	04	16		
Above 20001	05	04	09		
4.Work experience					
0-2 year	30	22	52	.0849	0.99
2-4 year	32	22	54		
4-6 year	07	05	12		
Above 6 year	01	01	02		

Discussion

The present study was undertaken to assess the effectiveness of a self-instructional module (SIM) on knowledge regarding the prevention of hearing loss among marble industrial workers in selected marble industries in Udaipur, Rajasthan.

The study findings revealed that all participants (100%) were male, and 68.33% were between 18 and 25 years of age. Around 75% of participants had primary and secondary levels of education,

and only 12.50% were graduates. Almost half, 50.83%, of the participants had a monthly income between 5000-1000/- Rs. Only. Around 43.33% had experience of between 0-2 years, and 45% had 2 to 4 years of experience in the marble industry. And none of the participants attended any safety seminar on hearing loss. These findings are supported by a study conducted on automotive industry workers in Malaysia, in

which the majority of the participants were male, 99.6%.⁸ A study conducted in Delhi also found that 90% of the participants were males, and 60% of them were between the ages of 23 and 29 years.¹¹ A cross-sectional study from North India revealed that 71% of participants had primary and secondary levels of education, and only 10% of participants were graduates.¹² A study among automobile workers found that 43.3% of participants had a monthly income between 6000-8000/- Rs. and around 50% of participants had experience between 0-3 years.¹³ A study from Malaysia regarding permissible hearing threshold levels among automobile workers revealed that 90% of the participants were male, and 90% of the participants had <5 years of experience.¹⁴

This study found that the majority of the participants (95.83%) had an inadequate knowledge level, and 4.17% had a moderately adequate knowledge level in the pre-test, while 95% of the participants had an adequate knowledge level, and 5 % had a moderately adequate knowledge level in the post-test. These study results are strongly supported by findings of a study conducted among Tanzanian iron and steel workers in which the majority of the participants (94%) had poor knowledge regarding occupational noise exposure and hearing loss.¹⁵ A study among ambulance drivers also found that the majority of the participants had a moderate knowledge level regarding occupational noise exposure.¹⁶ A study in Kerala, India, also revealed that 65% of participants had poor awareness regarding hazardous noise, safety, and the importance of ear protection devices.¹⁷ This study result was partially supported by the findings of a study in which only 44% of participants had an adequate knowledge level regarding noise-induced hearing loss.¹⁸ A study on industry workers also revealed that less than 40% of the participants had a potential health impact of noise.²⁰ Contradictory findings revealed by some studies, in which most participants had adequate

knowledge on aspects and causes of hearing loss.^{9,19}

Participants in our study scored 35.35% as the maximum mean percentage knowledge score in the prevention and complications of hearing loss, while 22.76% scored as the minimum mean percentage knowledge score in the introduction to hearing loss domain in the pre-test. Whereas in the post-test, participants scored 99.66% as the maximum mean percentage knowledge score in the anatomy and physiology of the ear domain, while 84.12% scored the minimum mean percentage knowledge score in the domain of signs, symptoms, and diagnosis of hearing loss. KAP study in Malaysia found that knowledge level in treatment aspects was 15.5%, sign and symptoms of NIHL (20.2%), risk factors (31%), preventive aspects (54.3%) and causes of hearing loss (58.3%).²¹ Some research findings revealed that there was a below-average knowledge score in each subsection of the knowledge level on noise-induced hearing loss.^{9,22}

The present study revealed that the post-test mean knowledge score of 23.59 was higher than the mean knowledge score of the pre-test of 7.26; the enhancement in the knowledge level was 16.33, indicating a gain in knowledge level by the participants. The data further represents that the 't' value of (36.21) was significantly higher than the table value (1.96) at 0.001 significance level. This indicated that there was a significant difference in the pre-test and post-test knowledge scores of respondents, and the educational intervention was effective in increasing the participants' knowledge level regarding the prevention of hearing loss. A study among marble industry workers also revealed that the mean score of post-test knowledge, 27.58, was apparently higher than the mean score of pre-test knowledge, 13.69, among marble factory workers regarding prevention and management of occupational health hazards.²⁴ There were highly statistically significant differences between pretest and posttest regarding workers' knowledge of Occupational Health Hazards.²⁵ Health education intervention elicited

statistically significant changes in mean knowledge score overtime.^{23,26} A quasi-experimental study revealed that participants had low scores regarding knowledge about hearing health in the work setting for both groups in the pre-test, but significant improvement in knowledge was observed after intervention in the Study Group.²⁷ In pre test there was no difference in the total scores of hearing health knowledge and health belief between the intervention group and control group, while after intervention there was significant improvement in knowledge level in intervention group.²⁸ Education and knowledge have a strong influence on participants attitude regarding noise induced hearing loss prevention.^{29,30}

Present study found that there was no influence of the socio demographic variables on the knowledge level of the participants regarding prevention of hearing loss. In a research finding, socio demographic variables were not associated with knowledge level of the participants about hearing health.²⁷ There were opposing findings, in which all demographic variables were associated with the knowledge level regarding prevention and management of occupational health hazards among marble factory workers.²⁴ Some research studies also found gender and work experience of the participants

was associated with the awareness level regarding noise induced hearing loss.^{20,31}

The present study was limited to marble industry workers and marble industry of Udaipur. Control group not included hence the effect of extraneous variables could not be studied. Standard tool was not utilized. Attitude and practice aspects might be investigated.

Conclusion

The Finding of present study strongly recommend the need to provide self instructional module in form of education program to increase the knowledge regarding prevention of hearing loss among marble industrial worker in selected marble industry and equip them with adequate knowledge to deal with the problem. The finding of present study revealing that there was significant improvement in the level of knowledge of marble industrial workers indicating educational intervention was effective.

Acknowledgement

This study's success is largely due to the support and direction provided by numerous people. Thank you, everyone, from the researchers. The researchers are also thankful to the marble industry workers, who spent their valuable time and supported us during data collection.

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