

Criteria for Inclusion of Literature:

- a) Published in peer-reviewed journals since last 10 years (2012 to 2022).
- b) Adult school teachers in age group 20-50 years of age.
- c) Pre- and post-vocal hygiene training and program comparison which was done to evaluate the voice parameters.
- d) Studies that investigated outcomes and effectiveness of vocal hygiene practice and education in school teachers.

Criteria for Exclusion of literature:

- a) Studies with unclear findings
- b) Duplicates studies that were found multiple times in different databases
- c) Studies that were published earlier than 2012.
- d) Studies that included teachers other than school teachers such as music and singing teachers, university teachers etc.

Data Extraction :

The titles and/or abstracts retrieved from the search strategies were screened to find the studies that matched the inclusion criteria. The potential studies' entire texts were then obtained and compared to see if they qualified. The data that was extracted covered the following topics: study population, methodology, participant demographics, including evaluation techniques, and treatment outcome. Using a pre-designed table, the data from the selected studies was extracted (Table 1). Additionally, data on the eligible studies that met the inclusion criteria were retrieved, including information on the year of publication, the kind of publication, the study design, the research type, the research topic, the study's origin, and author profiles with their affiliations.

Table 1: Shows the pre-study format for data extraction

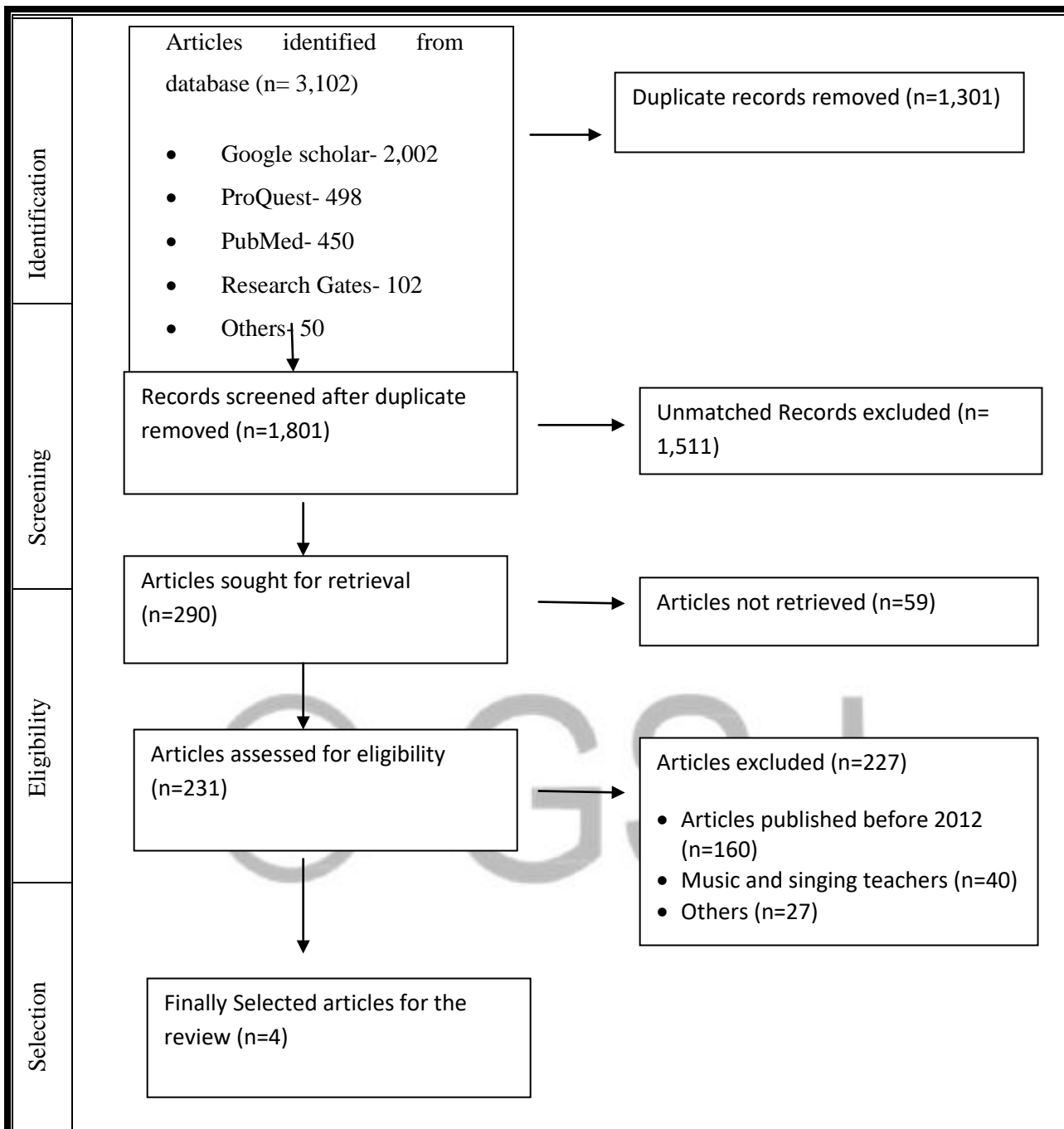
Title of the article	
Authors	
Year of publication	
Journal	
Database	
Study design	
Participants	
Vocal hygiene techniques	
Results	

RESULT AND DISCUSSION

Selection of articles:

Identification of the articles relevant to the current topic was important step and using key words to the different electronic databases, 3102 records were identified. Different database included Google scholar (n=2002), proQuest (n=498), PubMed (n=450), ResearchGate (102) and Others (n=50). From the total identified articles (3,102), duplicate articles (1,301) were excluded and remaining 1,801 articles were screened for the study. The articles (1,511) that did not match the review topic were also excluded. Remaining 290 articles were taken into consideration for further process and 59 articles were not able to be retrieved and were also not included. 231 articles were assessed for eligibility for inclusion in the current review. Articles that were published (160) earlier than 2012 were also not included. 40 teachers other than school teachers, like music and singing teachers, were also excluded from the study. And unspecified teachers and others (27) were also excluded from the study. Finally, only four articles fully matched our eligibility criteria and were selected for the study. These four articles are the latest research papers that are published in journal of voice between 2012 to 2022. These all papers include vocal hygiene practice and education program in school teachers and all papers are comparative study before and after the vocal hygiene practice and education.

Study design and characteristics: Papers selected for the current review was all pre and post test research design depending on comparative, observational, training survey and experimental study (Table 2). The outcomes and effectiveness of vocal hygiene practice and program on vocal health are listed in Table 3. Nallamuthu. included 17 female teachers in their study and Porcaro. included 26 teachers in which 25 were female and 1 male. Faham. divided 127 teachers into two groups (treatment group- 61 and control group-66) and Pizolato. also divided 102 teachers into two groups (experimental group and control group). Figure 2: Shows the Diagram that illustrates the PRISMA (Moher, Liberati, Tetzlaff, & Altman, 2020) Process of identification, screening and selection of the articles for the present study.



Outcomes of vocal hygiene training and program:

All the four articles selected for review showed positive outcomes on vocal quality of the teachers. Overall throat discomfort was reduced whereas breathe control was improved in most of the teachers and almost everyone felt some kind of improvement in voice quality. Table 2 shows the objectives and study design of the selected articles. Pre and post test questionnaire, training survey, experimental and comparison were done to find out the outcomes and effects of vocal hygiene in teachers. Table 3 shows the outcomes measures and findings of all the four selected articles. Three to eight months was the duration of vocal hygiene practice and program in the

selected articles. Acoustic analysis, vocal handicap index (VHI), Voice disorder profiles (V-DOP), McNemar test, Ling wave phonetogram and questionnaire were the outcome measures to find out the outcomes of vocal hygiene practice and program. The treated group displayed clear improvement in voice symptoms, maximal phonation time and quality of voice and Voice Handicap Index values.

Table 2: Shows the final set of four articles selected for the review and compilation of their characteristics and design.

Author /Year	Title of the paper	Journal	Objectives	Study design
Nallamuthu et al. (2021)	Outcomes of vocal hygiene program in facilitating vocal health in female school teachers with voice problems	Journal of Voice	To estimate the outcome of instituting a sociocultural relevant vocal hygiene program in facilitating vocal health among female teachers	Pre and post-comparative study (questionnaire)
Porcaro et al. (2019)	Impact of Vocal Hygiene Training on Teachers' Willingness to Change Vocal Behaviors	Journal of voice	To determine whether education on vocal hygiene practices would impact teachers' willingness to modify vocal behaviors	Pre- and post-comparative study (questionnaire)
Faham et al. (2015)	The Effects of a Voice Education Program on VHI Scores of Elementary School Teachers	Journal of voice	To investigate the effects of a voice education program on the Vocal Handicap Index (VHI) scores of elementary school teachers	Pre- and post-comparative study (experimental design)
Pizolato et al. (2013)	Evaluation of the effectiveness of a voice training program for teachers	Journal of voice	To investigate the effects of a voice education program to teachers on vocal	Pre and post-comparative study (experimental)

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Table 3: Shows the outcome measures and findings of vocal hygiene training and program in teachers.

Authors	Participants	Techniques	Durations	Outcome measures	Final outcomes
Nallamuthu et al.	17female teachers	Proper posture and alignment, a healthy vocal diet, enough hydration, vocal exercises while teaching, and an optimal speaking environment.	4 weeks	Voice disorder profiles (V-DOP), McNemar test, Ling wave phonetogram	i)Improvement in throat discomfort and breath control ii)Perceptually minimal improvement in voice quality iii)V-DOP- overall change in severity iv)VFI- improvement in voice after voice rest
Porcaro et al.	26 teachers (female-25 and male-1)	Training - voice production, healthy, and unhealthy vocal behaviors, impact of phonotrauma behaviors, and positive effects of vocal hygiene techniques.	5 weeks	Questionnaire (0-6 scale and statistical analysis program (IBM SPSS Statistics, version 21)	i) Teachers seem to benefit from education in vocal hygiene and proper voice use. ii)Teachers engaged in vocal hygiene behaviors by virtue of vocal hygiene training

Faham et al.	127 teachers (treatment group-61 control group-66)	i)Treatment group-breathing pattern modification, laryngeal muscle tension reduction ii)control group	8 weeks	Vocal handicap index Questionnaire	i) Teachers in the experimental group significantly raised their VHI scores, while those in the control group saw a decline.
Pizolato et al.	102 teachers (women-81 and men-21)	i)Experimental group: vocal hygiene and voice training exercise ii)Control group	3 months	Acoustic analysis, Student t test, Proc MIXED	i) The experimental group's voice quality improved after voice training exercises. ii) Voice training exercises had an immediate and beneficial impact on voice quality, but they were not continued over time.

In an Indian study Nallamuthu, Boominathan, Arunachalam and Mariswamy (2020) investigated a thorough voice evaluation process, it was anticipated that the implementation of a socioculturally relevant vocal hygiene program would facilitate vocal health among seventeen female schoolteachers who had experience of teaching of ten years in average. Before and four weeks after the vocal hygiene program (VHP), everyone received a thorough voice assessment that included subjective, objective, and self-perceptual vocal measurements. To compare continuous variable pre- and post-treatment measures, the Wilcoxon signed ranks test was utilized. After VHP, teachers stated that hazardous vocal and nonvocal activities had decreased. Improvements were noted in vocal and associated symptoms, including heartburn, throat discomfort, and difficulties controlling ones breathe while speaking. The quality of the voice barely changed perceptually (overall grade). All stroboscopic examination parameters showed changes, with the exception of the nonvibratory part and ventricular fold hyper-adduction. V-DOP scores showed improvement in the functional domain, physical domain, and overall severity. After a period of voice rest, VFI showed that teachers' voices had improved. Although VHP helped teachers become more aware of potentially dangerous

phonotraumatic behaviors and their vocal health, its effectiveness in enhancing teachers' voices physiologically was limited.

Pizolato, Rehder, Dias, Meneghim, Ambrosano, Mialhe, and Pereira (2013) examined the impact of a voice education program for teachers on vocal hygiene and exercise for vocal function, and contrast a pre- and post-vocal exercise for the teacher's voice quality. A 102-person random sample was split into two groups: the experimental group (29 women and 7 men) received vocal hygiene instruction and training activities, while the control group (52 women and 14 men) received vocal hygiene instruction. Men's mean fundamental frequency (f_0) fell with the cervical posture and relaxation workouts, whereas women's f_0 increased with the phonation, intensity, and frequency exercises and their glottal to noise excitation ratio increased. After three months, there was no statistically significant difference between the inter group judgments. In the final evaluation, the control group had higher mean voice intensity. The teacher's voice quality improved immediately after voice training activities, but the improvement did not last over time, suggesting that further efforts should be made in schools to achieve this goal.

On the same note Faham, Ahmadi, Drinnan, Saadatmand, Fatahi and Jalalipour (2015) studied the effects of a voice education program on voice handicap index (VHI) score in 127 elementary school teachers divided into training (61) and control group (66). Voice instruction was provided to teachers in the trained group for 4 weeks, and they then followed the curriculum for another 4 weeks. To determine whether the results (change from pre- to post training time) were statistically different from zero, the Wilcoxon signed rank test was performed and to compare the distribution of scores between the teaching and control groups, the Mann-Whitney U test was utilized. Teachers in the training group considerably reduced their overall VHI score (from 14.2 to 6.8), but those in the control group significantly increased their score (from 10.1 to 13.7). This outcome suggests that a voice education program can benefit teachers' voices and sustain voice quality.

Porcaro, Howery, Suddhandron and Gollery (2019) studied teachers' readiness to change their vocal actions that would be influenced by training on the effects of vocal hygiene practices (Table 3) Teachers participated in a one-hour instruction on vocal hygiene techniques between the pre- and post training questionnaires. This instruction covered fundamentals including the anatomy and physiology of the voice, good and bad vocal habits, the consequences of phonotrauma, and the advantages of vocal hygiene practices. The findings demonstrated that vocal hygiene training had a statistically significant impact on teachers' desire to adopt vocal hygiene behaviors. By virtue of receiving vocal hygiene instruction, study participants reported feeling more motivated to practice the targeted vocal hygiene activities in about 90% of the cases. Finally, it can be said that teachers are open to learning about proper voice use and vocal hygiene practices.

Nallamuthu. (2021), the best speaking environment, good posture and alignment, a healthy vocal diet, adequate hydration, vocal exercises while instructing, and overall changes in vocal severity can all improve voice quality. Similar findings were made by Porcaro. (2019), who discovered that people appear to gain from education in vocal hygiene and appropriate voice use after learning about appropriate voice production, healthy, and unhealthy vocal behaviors, the impact of phonotrauma behaviors, and the advantages of vocal hygiene techniques. In the Faham. (2015) study, the training group's VHI scores significantly improved after their breathing patterns were modified and their laryngeal muscle tension was decreased. Vocal hygiene and voice training exercises in the experimental group demonstrated an immediate and positive impact on voice quality, according to Pizolato. (2013) findings in a different controlled study. Overall, every study pointed to a benefit of vocal hygiene instruction and programs.

DISCUSSION:

According to an analysis of the four studies, vocal hygiene practices and programs changed how people perceive the quality of their voices and the production process as a whole. Overall improvement in voice quality and breathe control and reduction in throat discomfort were noted. Studies by Faham (2015) and Pizolato (2013) divided teachers into two groups (experimental/training group and control group). In both studies, experimental/ training group showed improvement compared to control group (Table 3) Only few articles related vocal hygiene practice and program between 2012 to 2022 has been published. The majority of the analyzed studies were observational pre- and post-test designs without control groups for comparison. To establish a greater level of proof, additional randomised controlled studies are therefore required. The current study also discovered that the majority of research only included a small population (Nallamuthu 2021 and Porcaro 2019).

In studies, female teachers were considered more than male teachers. It will also be necessary to undertake multicenter studies to ascertain the effectiveness of these procedures and programs for various demographics, genders, and clinical practitioners. It is generally acknowledged that well-conducted randomised controlled trials offer valuable information. However, observational research may also yield significant information, particularly if there are few studies using randomised controlled trials (Barton 2007). More Indian studies related to vocal hygiene in teachers is needed. Long term positive outcomes of vocal hygiene practice and education is not clearly mentioned in the studies. There were two uncontrolled cohort studies and two randomised controlled trials among these two investigations. Despite a variety of flaws in their methodological approaches, they all demonstrated positive results when voice hygiene practices were used.

The primary tool used by teachers is their voice. Their professional performance may suffer as a result of prolonged dysphonia, which may need sick leave and/or reassignment to administrative duties for which they are not always equipped or motivated. The main objective should be to prevent voice issues in instructors. The best solution is prevention, which calls for taking preventive action before a problem even emerges. Unfortunately, not many schools have this situation. Munier and Kinsella (2008), discovered that 305 teachers who answered a questionnaire on vocal quality revealed that 93% had never received any professional advice or training to prevent voice issues. Prevention of voice disorders can be minimized if proper vocal hygiene education and training is provided to teachers before they start teaching profession.

Most of the schools in remote areas in India, has high teachers to student's ratios. Teacher has to take continuous classes and has to depend on their voice. To make audible to the corner and last benches, teacher need to raise their vocal effort and loudness which lead to some kind of phonotrauma such as dryness, discomfort, Pain, foreign body sensation and loss of voice. This is all because teachers do not get proper vocal hygiene education and facilities to protect their voice. Microphone is rarely used by school teachers in rural areas of India.

SUMMARY AND CONCLUSION

The majority of jobs in the modern world need the use of a voice, and people who work as professional voice users are at a greater risk of developing voice disorders, which can ultimately impair their vocal ability. The strength and quality of the voice can be harmed by misuse and abusive behaviors that he/she might be unknown of. The main objective of vocal hygiene is to reduce stress on the vocal tract and produce quality voice with less effort. To fully meet the vocal demand, one needs a backup that can sustain quality while minimizing wear and tear on the glottal area. Teaching profession is heavily dependent on vocal capacity of the individuals. Due to high pitch voice and higher fundamental frequency, female teachers are even at more risk of vocal damage compared to male teachers. Professionally teachers are the one who use their voice more loudly and effortfully compared to other professional voice users. Due to lack of vocal hygiene training and education, many teachers become victim of poor vocal health and frequently suffer from some kind of voice disorders.

According to Nallamuthu (2021) proper posture and alignment, a healthy vocal diet, enough hydration, vocal exercises while teaching, and an optimal speaking environment can overall change in vocal severity and improve quality of voice. Similarly, Porcaro (2019) found teachers seem to benefit from education in vocal hygiene and proper voice use after learning appropriate voice production, healthy, and unhealthy vocal behaviors, impact of phonotrauma behaviors, and positive effects of vocal hygiene techniques. Training group in the study by Faham (2015) showed

significant improvement in VHI scores after breathing pattern modification and reducing laryngeal muscle tension. In another controlled study Pizolato (2013) found vocal hygiene and voice training exercise in experimental group showed immediate and beneficial impact on voice quality. Overall all studies suggested some kind of benefit of vocal hygiene training and program.

Implications of the current study:

- The study supports the notion that using vocal hygiene techniques as part of curative and preventive treatments is safe.
- Teachers can benefit from vocal hygiene training and education program and can get rid of vocal misuse and abusive behaviors.
- Vocal hygiene practice can reduce throat discomfort, dryness, foreign body sensation in throat and can improve breathe control and quality of voice.

Limitations of the studies:

- The bulk of the participants in the studies were female teachers, which resulted in a limited sample size. The results could be strengthened by future research with a larger randomized sample size and the inclusion of men to examine gender differences.
- Long term positive outcomes were not clearly mentioned in the studies.
- Inadequate amount of instrumental and acoustic analysis of voice were performed prior to vocal hygiene training and post training.
- Vocal hygiene techniques were not clearly mentioned and limited techniques were applied to the teachers during the training period.

Finally concluding, current review suggests that vocal hygiene training and program has positive outcome on teacher's vocal health. Improvement in throat discomfort, breathe control and quality of voice was seen in most of the teachers. Voice rest also improved the quality of voice over short period of time. Vocal hygiene practice can be used as a preventive and therapeutic approach by teachers to maintain vocal quality and produce voice more efficiently. Teachers in the experimental group significantly raised their vocal handicap index (VHI) scores, while those in the control group saw a decline. Voice training exercises had an immediate and beneficial impact on voice quality, but they were not continued over time. Teachers are engaged in vocal hygiene behaviors by virtue of vocal hygiene training. Larger number of teachers can be included in random controlled type of study to get more appropriate results. At the end, all four qualitative studies found vocal hygiene training and program can help teachers to produce voice more efficiently and economically and help them to get rid of vocal misuse and abuse.

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