

Knowledge, Attitude and Practices Towards Vocal Health Care Amongst Indian Carnatic Singers

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Summary: Objective. The knowledge, attitudes and practices of Indian Carnatic singers is a dimension that yet to be explored in detail. The aim of the current study was to explore these knowledge, attitudes, and practices amongst Indian Carnatic singers towards vocal health care.

Study design: Cross-sectional online questionnaire-based study.

Method. A cross-sectional online questionnaire-based study design was used to explore the knowledge, attitudes, and practices of Indian Carnatic singers towards vocal health care. The study was conducted in two phases, phase I involved questionnaire development and validation while phase II involved collection of data and further analysis.

Results. One hundred trained self-identified Indian Carnatic singers participated in this study. These singers displayed good knowledge and positive attitudes towards vocal health care. A preference (73%) towards home remedies was noted as compared to seeking medical attention. The measures reported by the singers for maintaining good vocal health revealed use of several home remedies, vocal as well as non-vocal measures.

Conclusion. The findings of the present study reveal the knowledge and attitude of Indian Carnatic singers towards vocal health care as well as highlight several interesting practices.

Key words: Carnatic singers—Voice—Vocal health—India.

INTRODUCTION

India is a country that takes pride in its rich cultural diversity and traditions. The singing styles in India can be divided into folk, classical and semi-classical styles. It has evolved under several influences and is the product of devoted musicians and singers. Indian classical music started as one system, which later evolved into two distinct forms - Carnatic and Hindustani, with Carnatic music primarily practiced in Southern India and Hindustani music practiced in Northern India. The roots of the present-day Carnatic form of music can be traced back to the early or middle 18th century.¹ The word *Carnatic* comes from a Sanskrit word for “that which is pleasing to hear”. Carnatic music is highly structured and is performed as a devotional offering to Hindu deities. It comprises of a repository of a large collection of compositions, each with its own identity, presentation style, tempo, and emotional content.² The distinct traditions associated with the compositions as well as practices of this form of music have been maintained to the present day. A complete rendition in Carnatic music involves an exploration of rhythm, melody, and prosody within an established framework, and has evolved over hundreds of years.³

Carnatic singers are the heritage carriers and form the backbone of the cultural essence of Carnatic music. They play a role in different aspects of society such as in worship,

folklore, and in the entertainment industry. The demands on a singer's use of voice are influenced by their singing style and the aesthetic they are creating. All singing and speech production tasks rely on adequate coordination of the respiratory, phonatory, resonatory, and articulatory subsystems. The adequate coordination of these subsystems is critical for good vocal quality and a well-functioning vocal system. In order to skillfully manipulate a wide range of notes and loudness levels while performing complex articulatory actions, singers manipulate subglottal pressure, intrinsic and extrinsic laryngeal musculature.⁴ The load placed on a singer's voice exceeds that placed on the general population.⁵

Devadas *et al.*⁶ performed a survey study on Carnatic singers and singing teachers and found that they often experienced vocal symptoms such as fatigue, reduced pitch range, and changes in voice quality. In addition, secondary signs and symptoms such as clenching of the teeth, hearing loss, frequent upper respiratory infections, stress related to their profession and medications for other health conditions further contributed to a higher risk for voice problems. The studies in vocal and non-vocal habits of Carnatic singers revealed poor vocal hygiene habits and practices such as poor food habits, throat clearing and poor vocal hygiene.⁷ A study by Arunachalam *et al.*⁸ revealed that these singers often engaged in phonotraumatic behaviors such as inadequate voice rest before a performance, singing loudly and in unsuitable voice ranges. These singers complained of vocal fatigue, difficulty singing in the desired pitch range, and dryness of the throat.

While we now have some information on the vocal experiences of Carnatic singers, little is known about their vocal health practices. There are only a handful of established music schools with a standardized curriculum for vocal students. Most singers learn from individual singing teachers

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and their knowledge of music and vocal health is dependent on that individual. Many practices regarding vocal care are passed down through the generations and find their origin in Ayurveda, a natural system of medicine that originated over 5000 years ago in India. A large number of these practices have not been empirically tested as yet and hence their effectiveness is based on anecdotal experiences. Singers are also very aware of their voice when they are singing but may not be as mindful of their vocal behaviors during non-singing tasks and activities. True vocal health is reflected by their vocal habits as well as the daily lifestyle of the singer. To effectively take care of their vocal instrument, singers need to be diligent about their voice use and lifestyle choices such as dietary, fitness and sleep habits.

The awareness, knowledge, attitudes towards seeking help for voice-related concerns and practices toward vocal health care determine longevity of voice use, which is particularly important for those that need it to sustain a livelihood. In the absence of these resources, singers may be unable to keep up with the demands of their profession, leading to an early or untimely end to their professional life. Identifying gaps in their access to this information will allow speech-language pathologists (SLPs) and singing teachers to provide more holistic care for these individuals and enable them to lead longer careers. In order to achieve that, the goal of our study was to profile the knowledge, attitudes and practices towards vocal health care followed by Indian Carnatic singers. Obtaining this information will provide us with information for future research studies and a direction to provide education on vocal care and health.

METHOD

A questionnaire based cross-sectional study was carried out to survey the knowledge, attitudes, and practices of Indian Carnatic singers towards vocal health care. This study was approved by the Institutional Ethical Committee (IEC KMC MLR 11-19/516). The study was conducted in two phases. Phase I involved developing and validating the questionnaire on knowledge, attitudes, and practices towards vocal health care, while phase II involved distributing the survey analysis of the responses.

Participants

Adult Indian classical singers who were trained in Carnatic classical music, with a self-reported minimum of one year of training, completed the survey. Singers who had discontinued their practices as well as those trained in or practicing other forms of singing were also excluded from this study. Singers were limited to the Carnatic style to maintain a homogenous group as singers that have learned the Hindustani style have differences in their practice styles and vocal health routines. All participants were fluent in conversational and written Indian English.

Phase I – Development and validation of the questionnaire

A questionnaire was developed in Indian English to gather data on the knowledge, attitude, and practices of Indian Carnatic singers towards vocal health based on previous literature on singers.^{9–11} This questionnaire was content validated by three SLPs with over 10 years of experience in vocology and special interest in professional voice. Out of these three, two SLPs were also trained singers with more than twenty years of training and experience in professional singing. Each question was rated using a four-point rating scale; not relevant, somewhat relevant, quite relevant and relevant.¹² The items rated as relevant and quite relevant by all the raters were retained and this version of the questionnaire was assessed for content validity and was given to three Indian classical singers to check for familiarity of language use and relevance. Scale-level Content Validity Index – Universal Agreement (S-CVI/UA) was calculated to estimate the content validity.¹³ An S-CVI/UA score of 0.84 was obtained indicative of excellent content validity.¹³

The final questionnaire comprised of the sub-sections below. All questions in the initial questionnaire were retained in the final questionnaire.

- 1 Demographics
 - a) Age (in years),
 - b) Sex (male/female/prefer not to say),
 - c) Extensive voice use in primary occupation (yes/no)
- 2 Singing-related details
 - a) Singing experience (in years),
 - b) age at which they started singing training (in years),
 - c) frequency of singing (days per week),
 - d) use of a warm-up regimen (regular/occasional/never)
- 3 Knowledge towards vocal health
 - a) Awareness about the role of a speech-language pathologist/voice therapist (yes/no/not sure)
 - b) Factors that influence vocal health to be answered using yes/no/not sure: Importance of warm-up voice before singing, adequate hydration, negative effect of talking with a sore throat, psychological factors that affect voice, negative effect of throat clearing, early dinner, and negative effect of excessive caffeine intake.
 - c) Effect of psychological factors on voice (open-ended question)
 - d) Rating their knowledge about the larynx (limited or no knowledge/basic knowledge /thorough knowledge)
 - e) Familiarity with singers'/vocal nodules (yes/no/not sure). If yes was indicated, respondent was asked to elaborate (open-ended question)
- 4 Attitudes towards vocal health
 - a) Reaction to the fear of losing voice (Options - stressed/unable to lead life normally/mild anxiety/not afraid or bothered)

- b) Reaction to change in voice (Options - stop using voice/self-medication/home remedies/consulting a doctor or go to a speech-language pathologist)
 - c) Statements displaying attitude towards voice and vocal health to be rated using agree/disagree/neutral - I have hesitation in seeking help for voice problems, Singing is the most important thing in life, Using my voice extensively would cause no harm to the voice, I give a lot of importance in taking care of my voice.
- 5 Practices towards vocal health care
- a) Professional consulted first for any voice concern (ENT/music teacher/family doctor/speech language pathologist)
 - b) Use of internet for questions related to vocal health (always/sometimes/never), use of internet before or after meeting or consulting a doctor
 - c) Preference for home remedies over medical consultation (always/sometimes/never)
 - d) Practice precautions to avoid voice problems (yes/no)
 - e) Activities undertaken to maintain good physical fitness (Open-ended question)
 - f) Need voice rest before a performance (yes/no/unsure), why is voice rest needed before a performance (open-ended question)
 - g) Consumption of soothing agents for maintaining good vocal quality (yes/no). If yes, which soothing agents (open-ended question)
 - h) Describe the measures you take to maintain good vocal health (open-ended question).

This finalized version of the questionnaire was made available for the next phase. The questionnaire is available upon request from the authors.

Phase II – Questionnaire administration

The questionnaire developed in phase I was made available as a Google Form and took approximately 5-10 minutes to complete. A link was generated and electronically mailed to the singers. The singers completed an online consent form prior to participation in the study. No personal identifiers were collected to maintain anonymity. The data collection was conducted from May 2020 to April 2021 and 100 participants completed the study. None of the surveys were incomplete. The recruitment of the singers was done using snowball sampling. The singers were recruited from a number of private music classes. Each singer was encouraged to send the questionnaire to other singers who fulfilled the inclusion criteria. Since the investigators had no direct control over the respondents, all the samples were independent and unbiased. Based on an a priori sample size estimation from data from Gunjawate *et al*¹⁴ the sample size was estimated to be 96 for 80% power.

Statistical analysis

The S-CVII/UA was computed to assess the content validity of the developed questionnaire. Descriptive statistics were performed to summarize the demographic variables. Continuous variables were analyzed using mean, standard deviation, and range while discrete variables were analyzed using frequency and percentages. To analyze the responses for open-ended questions, an inductive approach was used, wherein two researchers (RMN and DRG) read each response several times and coded the data into themes.

The responses to seven factors that influence voice were added together to obtain a total score. A maximum score of 7 could be obtained if all were answered correctly. Based on responses obtained for the question on self-rating of knowledge about the larynx, the singers were divided into three groups; limited or no knowledge, basic knowledge, and thorough knowledge. A one-way Analysis of Variance (ANOVA) was used to compare total scores for factors known to influence voice among the three groups. To determine the significant difference among the three groups, Tukey Post Hoc test was performed. A p-value of less than 0.05 was considered to be significant. Statistical analysis was done using SPSS 22.0 (IBM Corp., Armonk, N.Y., USA).

RESULTS

Demographics

The study consisted of 100 self-identified Indian Carnatic singers (21 males, 79 females), with a mean age of 23.95 (± 6.81) years, ranging between 18-62 years and mean singing experience of 11.94 (± 6.82) years and ranging between 1-41 years. The mean age at which the singers started their singing training was 8.81 (± 7.09) years and this ranged between 3-61 years of age. Of these, 29% singers reported being involved in a primary occupation that involves extensive voice use. The singers on an average sang for 4 days in a week (4.14 ± 2.19). Further, 43% reported that they occasionally followed a warm-up regimen, 28% followed it regularly while 29% did not follow a warm-up regime. The singers were asked if they were aware of a speech language pathologist/voice therapist, for which 66.6% responded in the affirmative, 22% were not aware while 12% were not sure.

Knowledge of Indian Carnatic singers towards vocal health

The singers were asked to correctly identify the effect of some factors known to influence vocal health. Their responses have been displayed in [Table 1](#).

Seventy-five percent of the singers displayed an awareness that psychological factors influence the voice. These singers were asked to elaborate on how psychological factors can affect their voice. Their responses were broadly categorized into direct impact on the voice, mental state, impact on

TABLE 1.
Knowledge of Factors Known to Influence Vocal Health.

Factors Known to Influence Vocal Health	Correct Response	Incorrect Response	Not Sure
Warm-up before singing	92 (92%)	5 (5%)	3 (3%)
Adequate hydration	84 (84%)	3 (3%)	13 (13%)
Negative effect of talking with a sore throat	74 (74%)	9 (9%)	17 (17%)
Psychological factors	75 (75%)	4 (4%)	21 (21%)
Negative effect of throat clearing	33 (33%)	47 (47%)	20 (20%)
Early dinner	50 (50%)	6 (6%)	44 (44%)
Negative effect of excessive caffeine consumption	55 (55%)	4 (4%)	41 (41%)

TABLE 2.
Descriptions of Effect of Psychological Factors on Voice.

Broad Categories	Descriptions
Direct effect on voice	<i>"We tend to miss the pitch and rhythm when under psychological pressure"</i> <i>"Many times when I have a strained voice, and the next day I have to sing somewhere, I tell myself, to my mind and voice, that "no issue... you will be alright tomorrow. Strained voice, relax and refresh... and it has worked.", "I have more control over my voice when I am mentally relaxed."</i>
Reflection of one's mental state on voice	<i>"A low-toned voice may be due to sadness (psychological mind set)"</i> <i>If am I am feeling nervous or feeling sad, my pitch will not be correct and voice balance will be less."</i>
Impact on health thereby indirectly affecting the voice	<i>"Stress has negative impact on physiology of voice. Positive emotions improve voice quality",</i> <i>"Stress makes your voice crack"</i>
Aware that stress can have an effect but unsure of the exact nature of the impact	<i>"Umm...not sure. I am not sure but I have heard that psychological factors may lead to vocal complaints or disorders."</i>

health thereby indirectly affecting the voice, and those that were unsure of the exact effects as displayed in [Table 2](#).

Next, the singers were asked, 'How do you rate your knowledge about the organ that produces voice (voice box)?' More than half the singers (59%) rated they had basic knowledge of the organ that produces voice while 27% rated they had thorough knowledge and 14% felt

they had limited or no knowledge. Based on this, the singers were divided into three groups; limited or no knowledge, basic knowledge, and thorough knowledge. The responses for the factors known to influence voice were summed for calculating total score and the distribution of these scores across the three groups has been shown in [Table 3](#).

TABLE 3.
Distribution of Scores on Factors Known to Influence Vocal Health (Total Possible Score of 7).

Rating of Knowledge of Vocal Organ	No. of Participants	Mean \pm SD of the Knowledge of Vocal Health Questions
Limited or no knowledge	14	3.71 \pm 1.82
Basic knowledge	59	4.42 \pm 1.33
Thorough knowledge	27	5.56 \pm 1.69

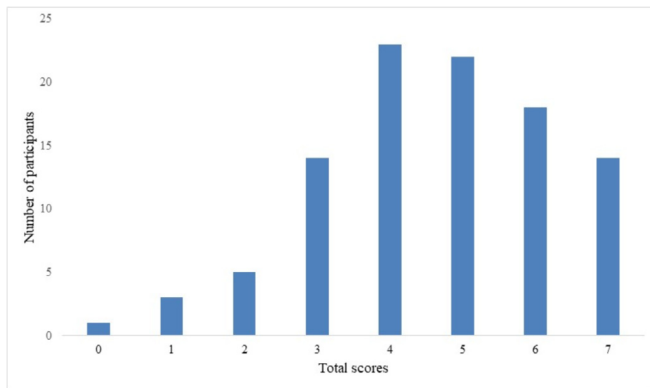


FIGURE 1. Total score of questions on knowledge of factors affecting voice.

Figure 1 summarizes the spread of the scores (0-7) across participants for seven questions assessing the knowledge of factors affecting voice.

A statistically significant difference between the groups was noted as determined using a one-way ANOVA ($F(2,97) = 8.24, P < 0.0005$). The effect size of $\eta^2 = 0.15$ indicative of high effect size¹⁵ was obtained. A Tukey post hoc comparison revealed that the singers who rated their knowledge levels to be thorough (5.56 ± 1.69) scored statistically higher on the knowledge questions as compared to those who rated it to be limited or no knowledge ($3.71 \pm 1.82, P = 0.01$) and basic ($4.42 \pm 1.33, P = 0.005$).

The final question in this section asked the singers if they had heard about singers'/vocal nodules and could describe

them. Fifty-seven percent of the singers had heard about singers'/vocal nodules, 32% had not heard while 11% were not sure. Broadly, they described nodules based on the physical appearance, cause, impact, and previous history of nodules. Some of the interesting descriptions have been displayed in Table 4.

Attitudes of Indian Carnatic singers towards vocal health care

Carnatic singers were asked to indicate their fear of losing their voice. Based on their responses, 42% responded that they would be stressed, 24% felt they would be unable to lead their life normally, 19% would be mildly anxious while 3% would not be afraid or bothered. The singers were asked next on how they would deal with an affected/changed voice. They had to base their response from the following options: stop using their voice, self-medication, home remedies, consulting a doctor or go to a speech-language pathologist. Their responses have been shown in Table 5.

As revealed in Table 3, when asked about reactions to change in their voice, 16% of the singers revealed that they would stop using their voice, only 20% would take self-medication, while 73% would rely on home remedies. A higher percentage of the singers would consult a doctor (52%) as compared to a speech-language pathologist (39%). The singers were asked to rate their attitudes on vocal health using a three-point rating scale of agree, disagree and neutral. These included attitudes towards seeking help for vocal health, anxiety, impact of vocal usage and importance of singing in their life. Their responses have been depicted in Table 6.

TABLE 4.
Descriptions of Singers' or Vocal Nodules by the Singers.

Broad Categories	Descriptions
Based on appearance	<p>"Small ball like structures on the vocal cords sheath",</p> <p>"Small bumps or growth in the vocal cords",</p> <p>"They are growths on the vocal cords that compromise the flexibility of the vocal cords".</p>
Based on cause of vocal nodules	<p>"Singing in unnatural low tones or at high intensities results in trauma to the vocal cords causing pin head shaped nodules.",</p> <p>"Basically, vocal nodules are growths on the vocal cords caused due to excessive use of voice like screaming, talking loudly, etc.",</p> <p>"Arise due to singing or talking for a long period of time.",</p> <p>"Due to overt stress of the vocal cords nodules occur on both the vocal cords especially in teachers and singers who practice without adequate warmup/unnecessary strain."</p>
Based on the impact	<p>"Some thickening, loss of elasticity, and in extremely abused voice some kind of scarring causing irreversible loss of voice... harsh sounding voice."</p> <p>"Nodules are formed on vocal cords of the singer. They change their voice and put tremendous pressure on the cords that causes pain and hurts even when one isn't singing. Currently suffering from the same problem (singer's nodules)"</p>
Based on having a history of vocal nodules	<p>"I had vocal nodules multiple times before due to abuse of voice caused by excess of wrong way of practicing, continuous change of pitch, acidity, PCOS (polycystic ovarian syndrome), etc."</p>

TABLE 5.
Reactions to Change in Voice.

	If My Voice is Affected/Changed I Would,		
	Yes	No	Sometimes
Stop using my voice	16 (16%)	34 (34%)	50 (50%)
Take self-medications	20 (20%)	61 (61%)	19 (19%)
Take home remedies	73 (73%)	4 (4%)	23 (23%)
Go to the doctor	52 (52%)	19 (19%)	29 (29%)
Go to an SLP	39 (39%)	23 (23%)	38 (38%)

TABLE 6.
Attitudes Towards Vocal Health.

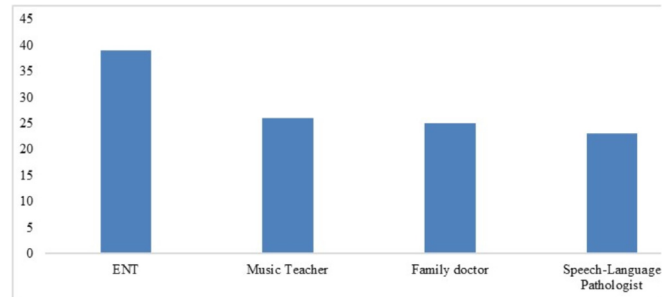
	Agree	Disagree	Neutral
I hesitate to seek help for voice problems.	9 (9%)	77 (77%)	14 (14%)
Singing is the most important thing in my life.	50 (50%)	6 (6%)	44 (44%)
Using my voice extensively would cause no harm to my voice.	21 (21%)	64 (64%)	15 (15%)
I give a lot of importance to taking care of my voice.	40 (40%)	13 (13%)	47 (47%)

As indicated in Table 6, half of the singers (50%) reported that singing was the most important thing in their life, and 77% had no hesitations in seeking help for voice problems. Forty percent of the singers gave a lot of importance to taking care of their voice and 64% disagreed on the statement, 'using my voice extensively would cause no harm to my voice' portraying a positive attitude toward vocal health care.

Practices of Indian Carnatic singers towards vocal health care

Carnatic singers were asked to indicate who they would consult first for any voice concerns. They could select more than one professional (therefore the total percentage does not add up to 100%) and their responses have been indicated in Figure 2.

The singers were asked to indicate if they used the internet for questions related to vocal health. A scattered response was seen for use of the internet; 40% did not use the internet, 24% always used the internet while 36% used it sometimes. Further, 48% revealed that they would use the internet before meeting or consulting the doctor while 12% would do so only after a medical consultation. When asked for preference towards home remedies over medical consultation, 43% replied sometimes, while 41% replied always, and only 16% replied never.

**FIGURE 2.** Professionals likely to be consulted initially for a voice problem.

Fifty-two percent of the singers reported to have been taking precautions to avoid voice problems. The singers were also asked about activities undertaken to maintain good physical fitness. Majority of the singers responded to undertaking more than one activity to maintain physical fitness. The reported measures were, exercise ($n = 53$), yoga ($n = 28$), lifestyle modifications ($n = 21$), sports ($n = 15$) and those who did not take any measures ($n = 7$).

The singers were asked if voice rest was necessary before a performance, to which 83% responded yes, 14% responded no while 3% were unsure. They were further asked to elaborate why voice rest was necessary. On thematic analysis, the reasons could be divided into four categories; for relaxation ($n = 25$), to improve the projection and maintain a good voice quality ($n = 22$), for endurance ($n = 15$) and, avoiding the effect of phonotrauma ($n = 14$). As described by some of the singers, "Continuous voice usage prior to performance can harm the vocal folds and during the performance, the voice may sound strained." "It rejuvenates your voice and lessens the strain;" "Like all regularly exercised muscles needing time to relax and recoup" and other responses that emphasize on the freshness of voice post voice rest, and the smooth flow of voice attributed to the same. Next, the singers were asked if they take any soothing agents for maintaining good vocal quality, only 14% responded yes. These agents included warm water, ayurvedic kashayas (*kasha: yam*, a generic term used for medicinal concoction in Ayurveda), salt water gargle, turmeric, tea and other plant based products.

The final question probed about the measures taken to maintain good vocal health. Based on the responses, three major themes emerged: home remedies, vocal measures and non-vocal measures. Figure 3 illustrates these measures reported by the singers for good vocal health. Twelve singers reported not following any measures for vocal health.

DISCUSSION

Vocal and non-vocal habits of Carnatic singers,^{6,7} Hindustani classical singers,¹⁶ Yakshagana artists,^{17,18} and non-classical/light music singers¹⁹ have been previously explored in several studies. While there is more data available on the knowledge and practices amongst singers in the Western countries, there are many cultural differences in teaching

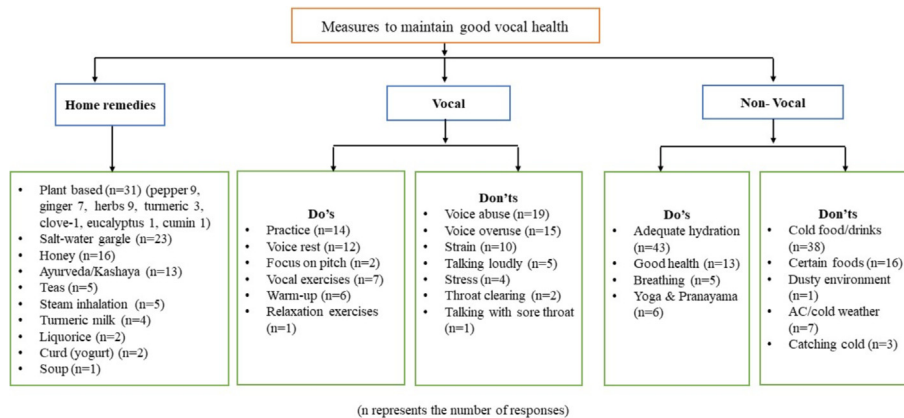


FIGURE 3. Measures to maintain good vocal health.

protocols, singing styles and techniques and, healthcare. The current study explored the knowledge, attitudes, and practices of Indian Carnatic singers towards vocal health care using an online questionnaire.

The present study included 100, self-identified, adult Indian Carnatic singers across the age range of 18-62 years and singing experience of 1-41 years. The mean age at which the singers had started their singing training was 8 years. The sex distribution of 3-4 female singers for every male singer has been a common trend across previous studies in the population of Indian classical singers.^{8,14} The singers, on average, sang for 4 days in a week and 43% followed a vocal warm-up regimen occasionally while 28% followed it regularly.

Previous studies among singers have reported a level of 23-30% awareness about the role of an SLP in the care of singers.^{20,21} The increase in this study to 66.6% is a positive change in the awareness amongst the singers for the care they can receive from an SLP. This positive change could have been the result of better awareness among singers and increased availability of SLP services. SLPs are extensively involved in the assessment and intervention of professional voice users and are vital to the rehabilitation team for any professional voice user. A delay in seeking out appropriate care due to a lack of knowledge on the available resources could further exacerbate their condition and further stress the singer.

Accurate knowledge of the vocal system is necessary for optimal voice use and care. As the singer gets more knowledgeable about the vocal system, it could lead to a more conservative and appropriate use of the voice. In the present study, a little more than half of the singers (59%) rated they had basic knowledge of the organ that produces voice while only 27% rated to have thorough knowledge. In a study on choir singers, 66% rated their knowledge of vocal anatomy and physiology to be basic or thorough.²⁰ These percentages are higher than those found by Sielska-Badurek *et al.*²¹ in their study where 20% of the classical singers (solo and choir) had “good knowledge” and only 5% had “very good knowledge”. When comparing the results from questions on

vocal health to the singers’ self-report on knowledge on voice, the singers that rated their knowledge levels to be thorough scored significantly higher than those who rated it to be limited or basic. The significant number of singers that reported to have limited knowledge on the voice and “not sure” for questions on it, is indicative of the pressing need to improve the knowledge on vocal health amongst these Indian Carnatic singers.

Carnatic singing has a strong ‘guru-shishya parampara’ or teacher-student tradition as well as ‘karna parampara’ or a tradition to pass knowledge from teacher to student. The advice and recommendations given by the singing teacher are considered to be the final word. However, this information is anecdotal and may not be supported by research or clinical evidence. There is a need to build a relationship between the singing teachers, physicians and SLPs to develop a more balanced team for the care of these singers. In the absence of health professionals, singers may try to sing through their hoarseness arising from a pathology, and further risk their vocal health. The importance singing holds in an individual’s life is a crucial aspect that influences their attitudes towards their singing voice and the impact of a voice disorder on their quality of life. Half of the singers in the study considered singing to be the most important thing in their life as compared to 76% of the singers in a study by Sapir *et al.*²² Further, 77% singers did not have any hesitation to seeking help for voice problems. The Indian Carnatic singers in the present study leaned towards relying on home remedies (73%) followed by visiting a doctor (52%) in the event of a voice complaint.

The singers were asked to indicate ‘who would you consult if you face a problem with your voice?’ Thirty-nine percent of the singers opted for an otolaryngologist followed by a music teacher (26%) and family doctor (25%), with the least responses for seeking out an SLP (23%). Consulting an otolaryngologist appears to be a common choice in studies across different types of singers, as seen by 42% of classically trained singers,²³ 74% Carnatic singers.⁶ Thirty-seven percent of classically trained singers,²³ only 8% Carnatic singers⁶ chose to go to their singing teacher for a voice

complaint. This information is important in understanding the likelihood of singers seeking medical attention for their voice concerns in order to avoid the use of incorrect remedies or over-the-counter medications.

The singers in this study were asked for their preference for home remedies over a medical consultation. Only 16% preferred a medical consultation over home remedies, while 84% preferred home remedies as a first course of treatment. In a study by Weekly *et al.*²⁴ vocalists were well-versed with traditional and alternative remedies, however, usually choose any remedy that was more readily available for them. Petty²³ also reported an eight times higher inclination towards home remedies among classically trained singers as compared to non-singers and 50% of these singers also found them to be effective. Studies in Indian classical singers have also highlighted the use of home remedies, some unique to India, for voice problems.^{14,25}

The internet has emerged as the most popular source of information due to the ease of access to a plethora of information on diagnosis to management of any health condition.²⁶ Studies have revealed that although information is available online with respect to vocal hygiene and voice care, there is a need to improve its suitability, readability and overall quality.^{27–29} In the present study, 40% Indian classical singers did not use the internet, while the remaining (60%) used it sometimes or always for vocal health questions. This difference in the degree of reliance on the internet may be due to the wide age range amongst the respondents, with the younger respondents hypothesized to be more likely to use the internet. The lack of voice rest especially between performances has been previously reported among Carnatic singers to act as a risk factor leading to voice problems.⁸ In the present study, 83% appreciated the importance of voice rest before a performance indicative of improved practices towards voice care. Further, 28% followed warm-up regime regularly while 43% followed it occasionally. Indian classical singers have maintained a positive perception towards vocal warm in a previous study and are aware about its importance and benefits.¹¹ A regular warm-up and adequate voice rest before the performance would benefit the performance of the singers and should be included while counselling them. Soothing agents are substances consumed to pacify or soothe the voice. These substances are often consumed before, after, or even during the singing performance. The use of soothing agents that are based on ancient and traditional practices has been reported in different types of professional voice users such as vedic chanters,³⁰ Hindustani classical singers,¹⁶ professional singers,²⁵ and, Yakshagana singers.¹⁷ Some of the examples of commonly used soothing agents across the studies include milk with different condiments such as pepper or turmeric, cardamom, or betel nut. In the present study however, only 14% reported the use of soothing agents.

Physical fitness has an impact on overall health, strength, core strength, and endurance, leading to a healthy and long life. Regular exercise can help in improving the strength as well as the functioning of the

muscles. Friedlander³¹ proposed the concept of ‘Complete Vocal Fitness’, where strength training, yoga and cardio are used in combination to improve the overall production of singing voice. Studies in singers have reported different types of routines or exercises for overall physical fitness. Boominathan *et al.*⁷ reported more male than female Carnatic singers engaged in sports, games, and bodybuilding. Singers in the present study took several measures towards their physical fitness such as exercise, yoga, lifestyle modifications, and sports.

Measures taken to maintain good vocal health are essential for a singer, as it decides the longevity of healthy voice use. In the final question, the singers were asked to describe the various measures taken to maintain good vocal health. Their responses were analyzed to identify the different themes: home remedies, vocal measures, and non-vocal measures. Home-remedies are a common choice for vocal health care among singers.^{6,8,16,23,25} India is known as the spice capital of the world and Indians are known globally for the use of spices and its inclusion in their daily diet. Common spices like turmeric, pepper, cardamom, cinnamon are easily available in an Indian kitchen and have been used as home remedies for common ailments. Singers in a study by Boominathan *et al.*²⁵ have reported the use of milk, pepper, turmeric, ginger, honey, athimathuram (liquorice), and salt water gargle as common home remedies for voice care. Herbal and natural medications were preferred by Carnatic and non-classical/light music singers.^{7,19} In the present study, plant based remedies using different herbs and spices were the most common home remedies. Calcioni *et al.*³² (2020) have developed the ‘Herbs for Voice Database’ that collates the information available for different plants and herbs in use for voice problems. Some of these remedies were found to be common to those reported in the present study. Vocal measures for good vocal health included habits incorporated and habits avoided in order to have a good sounding voice quality. The singers reported the use of vocal measures such as singing practice, and voice rest. Voice rest is a popular measure reported across several studies in different Indian classical singers for maintaining good vocal health.^{7,16,25} A majority of the singers reported avoiding vocal abuse and misuse as means to maintain good vocal health. It was good to note this positive practice adopted by the singers. Non-vocal measures for good vocal health were maintained through lifestyle modifications. Drinking water was the most common inclusion, followed by maintaining good overall health with a healthy diet. Singers reported avoiding cold food items like ice-creams and refrigerated drinks as well as certain food items such as, bananas, yogurt, oily, and spicy food. Previous studies in Carnatic singers have reported similar avoidance of certain food items including other foods such as citrus fruits, tamarind, a meat-based diet.⁷ Although there are no standard guidelines for good lifestyle habits for singers, most literature points towards following a healthy diet^{33,34} for maintaining good vocal health.

Limitations

As a self-reported questionnaire was used for data collection, these responses obtained might be subjective in nature. Only singers with an access to internet could be included as an online questionnaire was used. The use of a qualitative research design using one-to-one interviews might have provided more detailed responses for the open-ended questions. The vocal health status of the respondents at the time of the survey was unknown, which may influence the responses.

Conclusions and future directions

Overall, this study revealed that a large group of Indian Carnatic singers are knowledgeable about vocal health care and aware of the best-practices for voice care, there is still a need for increased awareness amongst the singers and singing teachers to seek out health professionals for voice complaints. A more in-depth study also needs to be performed on the effectiveness of commonly used home remedies for vocal health. Future studies will compare the knowledge, attitude, and practices among Indian Carnatic singers with vocal complaints and with no complaints. Home remedies and other practices indicated by these singers should be empirically tested for a better understanding of their effectiveness.

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