Prevalence and Risk Factors of Self-reported Voice Problems Among Yakshagana Artists

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Summary: Background. Yakshagana /jakʃaga:na/ is a form of folk theater of India. It is a blend of music, acting, dance, costume, dialogue, and stage techniques with an exclusive style and form. Even though Yakshagana artists (singers and actors) are professional voice users, no reports are available in the literature regarding the prevalence of voice problems (VPs) in these performers.

Aim. The current study investigated (a) the prevalence of self-reported VPs, (b) the different risk factors associated with the development of VPs, (c) the self-reported vocal health, and (d) the effect of VP on Yakshagana folk artists.

Method. This cross-sectional survey was conducted using a self-reported questionnaire. Data for the present study were obtained through convenience sampling by distributing 160 questionnaires to Yakshagana artists in and around Udupi /uɖupi/ and Mangaluru /maŋgalu:ru/ districts of Karnataka state, India. The results of the study are analyzed and discussed based on 129 eligible questionnaires.

Results. Career prevalence of self-reported VPs in singers and actors were found to be 91.2% and 74%, respectively, with multiple symptoms of vocal attrition. Frequent throat clearing was found to have a significant association with actors reporting VPs. Around 55% of artists missed their work for 2–3 days or more with an average of 2.12 days (minimum of 1 day to maximum of 5 days).

Conclusions. Overall, the results suggest that Yakshagana artists are at greater risk of developing VPs. Hence, there is a need for thorough understanding of factors influencing VPs and for educating the Yakshagana artists about voice care strategies.

Key Words: Voice problem–Prevalence–Yakshagana artists–Professional voice users–Survey.

INTRODUCTION

Persons for whom voice is crucial for their profession and is essential for their livelihood are considered as professional voice users (PVUs).[1,2] For example, voice is essential for teachers, singers, actors, newsreaders, lawyers, and cheer leaders. Due to their excessive voice usage, these individuals are at a greater risk of developing voice problems (VPs).[2–4] In the past, to estimate the prevalence of VPs, different studies have been carried out in different groups of PVUs. However, a large majority of these studies are done with teachers and the reported prevalence rates range between 11% and 81%.[3–8] Apart from teachers, limited studies have been conducted in singers, which report prevalence rates to range between 44% and 59%.[9–11] Further, prevalence studies conducted in other PVUs again suggest different prevalence rates in different groups of PVUs (59% in call center operators, 86% in politicians, 74% in vendors, 31% in professional broadcast journalists).[5–7] The increased risk of VPs in these PVUs highlights that they are under constant pressure to maintain good vocal health; if not, it could put their profession in jeopardy and also affect their quality of life.

Like the above-mentioned PVUs, folk actors and singers are also under constant stress to protect their voice and are at greater risk of developing VPs compared with the general population.[8] For instance, actors use their voice extensively for specific vocal demands such as shouting, crying, talking, changing accents, singing, and dancing while talking. They need to express the full range of emotions and project their voice over the noise, battle sounds, and music.[9] Apart from this, inhalation of smoke, dust, poor lifestyle habits (late-night eating, smoking, drinking alcohol), and makeup contents increase the risk of developing VPs in actors.[10] Similarly, singers are required to produce wide frequency and intensity ranges. In folk singing, there is a need to combine the songs with dialogues (verbatim) to express emotions and aspects of spoken language. Singers are required to possess good coordination of respiratory, phonatory, and articulatory systems and need a precise understanding of pitch and resonance tuning. These requirements vary according to the style of singing.[11] There are limited studies addressing the vocal problems of folk artists in the Indian context, and hence, the main purpose of the current study was to investigate the prevalence of self-reported VPs and to identify different risk factors that might contribute to the development of VPs in Yakshagana artists.

Yakshagana /jakʃaga:na/ literally means song (gana) /ga:na/ of Yakshas /jakʃas/ (exotic tribe as mentioned in the Sanskrit literature of ancient India). Yakshagana is one of the unique forms of folk theater of South Karnataka, India, which is a blend of singing, dancing, heavy costumes, makeup, and dialogue. Yakshagana art originated from *Vaishnava bhakti /vaiʃnavabakti/* movement in sixteenth century for entertaining and educating people. Typically, each Yakshagana troupe includes around 15–20 performers. Yakshagana performance is divided into *himmela* /himˈeɭa/ (includes singers and background musicians) and *mummela* /mumˈeɭa/ (includes actors). Yakshagana singer is referred to as *bhagavata /bagavata/*, who is the prime narrator of the story and guides the scripts. Yakshagana is generally performed in an open space from dusk to dawn. Its music is a separate genre of music, which is different from Hindustani

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/hindusta:ni/ and Carnatic /karnaṭik/ music systems of India. One of the unique features of Yakshagana singing is the eminence of high-pitched loud singing. The base note of the singer is usually in the higher octaves and rarely hits the lower octaves. They also sing with a loud voice. Such high-pitched loud singing is attributed to the singers' need to be audible to a large audience on an open stage and to compete with the loud background music (sound emitting from percussion instruments such as *chande /ʧanḍe/*). Yakshagana actors need to wear heavy ornaments, crowns, and belts, and dance to the music and narrate the story by actions. The complexity of dance and dialogues of actors depends on the character they played. The actors need to dance, sing, act, and get into philosophical debates and arguments throughout the show.[12,13]

Even though Yakshagana is one of the famous types of folk art of South Karnataka, India, only three studies are reported in the literature concerning the analysis of voice and singing in Yakshagana artists.[14–16] The results of these studies indicate a significant difference in voice characteristics of Yakshagana artists compared with non-PVUs. However, to date, there are no studies addressing the prevalence of self-reported VPs in Yakshagana artists. Hence, the aim of the current study was to explore the prevalence of self-reported VPs, the different variables associated with increased risk of VPs, and the effect of VPs on Yakshagana artists (singers and actors).

METHOD

Self-reporting questionnaire

For the current study, a self-reporting questionnaire was developed in English and then was translated to the Kannada language. The questionnaire was developed based on the inputs from other similar questionnaires available in the literature for singers, news readers, and teachers.[2,5,17] For the content validation, the questionnaire was distributed among five experienced speech-language pathologists (SLPs) who had more than 10 years of experience in the assessment and management of PVUs. They were asked to give their suggestions and comments on the content of the questionnaire. After incorporating the suggestions of SLPs, the questionnaire was distributed to five Yakshagana singers and five actors for the familiarity assessment. They were asked to give their comments and suggestions concerning the familiarity of the terminologies used in the questionnaire, relevance, appropriateness of the questions, and to identify any missing information. The questionnaire was modified as per the suggestions of artists, and the final questionnaire had 104 questions divided into following sections: demographic details, occupation, and training-related details, vocal and nonvocal habits, prevalence and nature of self-reported VPs, phonotraumatic behaviors, lifestyle factors, health-related factors, effect of voice problem, and voice care. The Appendix shows the questionnaire used in the present study. In the present study, career and point prevalence were estimated using the following operational definitions, respectively: "Have you had any voice related problems since you joined this profession that has prevented you from singing/acting" and "Do you have a problem with your voice today, which is preventing you from doing all you want to do," respectively.[17]

Participants and data collection

For this cross-sectional study, we contacted 16 Yakshagana troupe managers during their campaigns and explained the purpose of the study. These Yakshagana troupes were spread out in Udupi /uḍupi/ and Mangaluru /maŋgalu:ru/ districts of Karnataka state, India. In each Yakshagana troupe, there were 15–20 actors and 2–3 singers. The self-reported questionnaires were distributed to the artists who were willing to participate in the study. The questionnaire included a cover letter explaining the purpose of the study and a consent form. The filled questionnaires were collected back on the same day. The study was approved by All India Institute of Speech and Hearing (AIISH) Ethics Committee and it was funded by the AIISH research fund, AIISH, Mysuru /maisuru/.

Statistical analysis

Statistical Package for Social Sciences 20.0 (SPSS, IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) software was used for the statistical analysis. The prevalence of self-reported VPs in singers and actors was analyzed in percentages. In actors, using Pearson chi-square test, the difference between actors with and without VPs was analyzed with respect to demographic, occupational, phonotraumatic behaviors, lifestyle, general health–related factors, the effect of voice problem, vocal health, and voice care–related factors. In singers, Pearson chi-square test could not be performed as there was unequal number of singers with (n = 31) and without (n = 3) VPs. Hence, their results were discussed in percentages. Further, in actors, adjusted odds ratio (OR) with corresponding 95% confidence interval (CI) with multiple logistic regression using Wald forward selection criteria was used to investigate the association between the presence of VP and the different risk factors. The significance level was set at ($\alpha = 0.05$).

RESULTS

Overall, 160 Yakshagana artists agreed to participate in the study, out of which 40 were singers and 120 were actors. Out of 160 questionnaires, 135 filled questionnaires were returned with a response rate of 84%. After eliminating six incomplete questionnaires, the responses of 34 singers and 95 Yakshagana actors were used for the final analysis. Data for the present study were obtained during January to April 2016. In the present study, results for singers and actors were analyzed separately as the questions were designed according to their vocal demands. Hence, singers and actors were not comparable.

Demographic, occupation, and training-related details of singers

The mean age of singers was 43.76 years (standard deviation was 11.28 years) and most of them were between 26 and 50 years. The majority (>50%) of the singers had educational qualification below 12th grade. Eighty-two percent (n = 28) of the singers had more than 10 years of experience in Yakshagana singing. About 53% (n = 18) of the singers reported singing for 3–5 days in a week for at least 3–4 hours per day. Around 79% (n = 27) of the singers had joined Yakshagana singing practice after 15

years of age and had taken 2 years of singing training. However, the study did not inquire about the type of training received by these singers. Sixty-five percent (n = 22) of the singers warmed up their voice, and 53% (n = 18) of the singers rehearsed every day for at least 30 minutes before the performance. Humming (21%) (n = 7) and pitch gliding (53%) (n = 18) were the commonly practiced warm up exercises. However, cool down exercises are generally not practiced by singers. Around 50% (n = 17) of the singers were involved in other jobs, out of which 18% (n = 6) of them were using their voice in other professions. In addition to singing, 47% (n = 16) of the singers reported they were also involved in dialogue delivery during their shows. Most of the singers (56%) (n = 19) reported the moderate degree of background noise during the performance and 71% (n = 24) of them reported they need to raise their voice against background noise.

Prevalence and nature of self-reported VPs in singers

To estimate the career prevalence, the singers were asked to indicate whether they had any VP since they joined the profession that has prevented them from singing. Out of 34 singers who participated in the study, 91.2% (n = 31) reported in affirmative. Among these, 58% (n = 18) of the singers reported that they experienced VP at least once in 6 months, 19% (n = 6) reported once in 2–3 months, 10% (n = 3) reported once in 15 days, and 13% (n = 4) reported as frequently as once a week. Ninety-three percent (n = 29) of the singers noticed VP for more than a year and 7% (n = 2) noticed VP for a year. The onset of the VP was gradual for 42% (n = 13), sudden for 32% (n = 10), and intermittent for 26% (n = 8) of singers. For 29% (n = 9) of the singers, VP got worse since onset. Further, 48% of the singers reported they missed their performance (26% [n = 8] cancelled 1–2 shows, 13% [n = 4] cancelled 3–5 shows, 3% [n = 1] cancelled 69 shows, 7% [n = 2] cancelled 10–15 shows) in the last year due to VPs. Further, when the singers were asked whether they experienced VP on the day of the survey, 42% (n = 13) reported in affirmative. Out of which, 13% (n = 4) rated their VP to be mild, whereas 26% (n = 8) considered it to be a moderate degree of severity.

Vocal symptoms experienced by singers while singing

The singers were asked to indicate whether they experienced any vocal symptoms during or after singing performance. Vocal fatigue (71%) (n = 24), difficulty hitting or singing higher and lower notes (62%) (n = 21), hoarseness or breathiness especially in the higher pitch range (60%) (n = 19) were the symptoms reported by the majority of the singers. Other than these symptoms, the singers also reported the following symptoms: difficulty in making smooth register transitions (47%) (n = 16), effortful singing (41%) (n = 14), loss of vocal endurance and flexibility especially after singing for more than an hour (32%) (n = 11), tightness of muscles at higher pitches (29%) (n = 10), discomfort in the throat, especially after singing for more than an hour (24%) (n = 8), frequent coughing (18%) (n = 6), tension or pain in the throat, especially after singing for more than an hour (12%) (n = 4), pitch breaks, momentary loss of voice or other sudden changes (9%) (n = 3), and reduced breath support or shortness of breath (9%) (n = 3).

Vocal and nonvocal habits

According to 53% (n = 18) of the singers, combined variations in the quality of voice, loudness, pitch, and prosody are required to achieve the desired voice for Yakshagana singing. Compared with the other modifications in voice, variations in pitch, prosody, and loudness were considered as the important factor by 44% (n = 15), 12% (n = 4), and 9% (n = 3) of the singers, respectively. Twelve percent (n = 4) of the singers reported to have sometimes engaged in nonvocal practices such as clenching of teeth, tensing of the jaw, and neck muscles to make their voice or speech dramatic, whereas 85% (n = 29) of the singers reported that they never do that.

Phonotraumatic behaviors in singers

When singers were asked whether they indulge in any of the phonotraumatic behaviors (Figure 1), singing in the presence of throat infections (82%) (n = 28), frequent throat clearing (35%) (n = 12), and singing while physically unwell (35%) (n = 12) were found to be highly prevalent. However, abusive behaviors, such

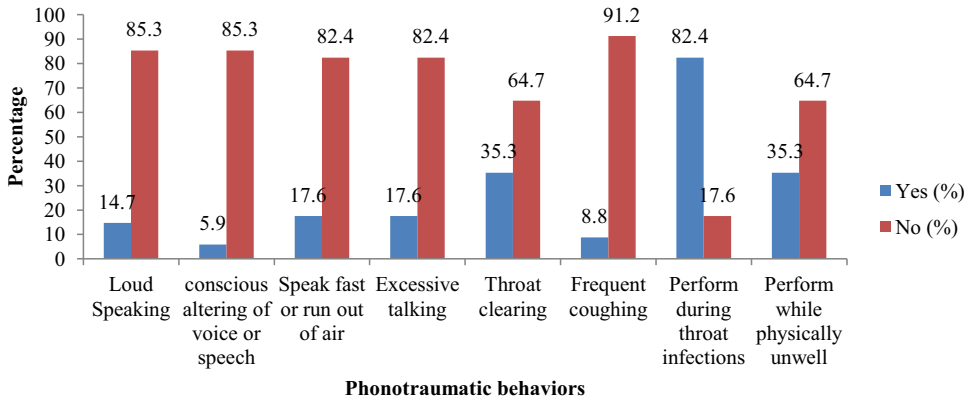

FIGURE 1. Phonotraumatic behaviors in singers.

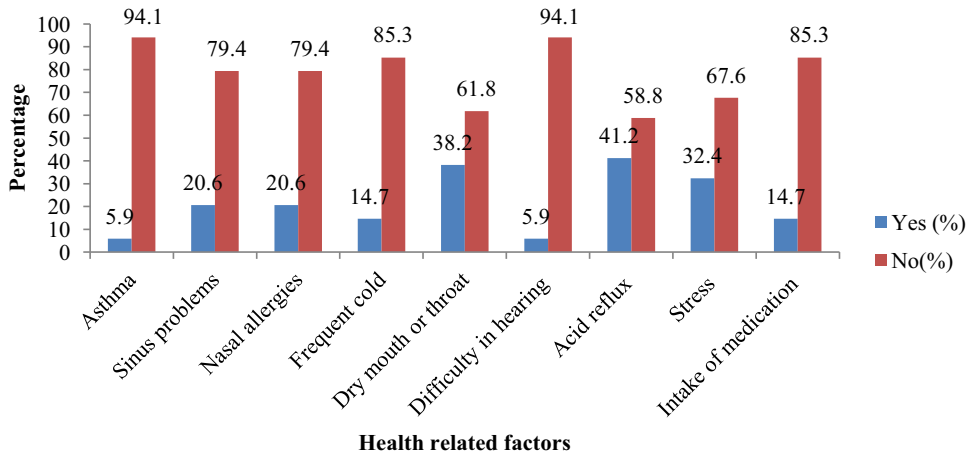

FIGURE 2. Health-related factors in singers.

as loud speaking, speaking fast or running out of the air, excessive talking and frequent coughing, were reported less frequently.

Lifestyle and health-related factors in singers

More than 90% (n = 33) of the singers reported that they were not involved in smoking or drinking alcohol. However, around 73% (n = 25) of the singers reported they drink more than two cups of tea per day. Around 82% (n = 28) of the singers reported they drink more than eight glasses of water per day. With respect to health-related factors, acid reflux (41%) (n = 14), dry mouth and throat (38%) (n = 13), and stress related to their profession (32%) (n = 11) (Figure 2) were reported by a relatively higher number of singers. Other than this, the singers also reported experiencing sinus problems and nasal allergies (20%) (n = 7), frequent cold (15%) (n = 5), and taking medications (15%) (n = 5) for diabetes mellitus, blood pressure, and acidity.

Effect of VPs and voice care in singers

Around 30% (n = 10) of the singers reported getting frustrated sometimes or very often. Around 68% (n = 23) of the singers reported missing work for 2–3 days and around 12% (n = 4) missed it for a week. Missing work did contribute to financial burden in 65% (n = 22) of the singers. Further, the singers did not report trouble interacting with family and friends, interacting socially, and using telephone due to the voice problem and they did not feel the need to repeat themselves to be understood as well. Only two singers sought help from professionals for their VP and the remaining 29 singers who experienced VPs did not seek any professional help for their VP. Around 53% (n = 18) of the singers reported that they do not consult physicians immediately after the onset of VP. Further, 59% (n = 20) of the singers reported that they have received some form of instruction, mostly from physicians, to care for their voice. Fifty-three percent (n = 18) of the singers considered a combined effect of loud talking, continuous talking, loud talking against background noise, reduced sleep and constant traveling could all be associated with the development of VP. Around 68% (n = 23) of the singers were aware that taking voice rest during throat infections can avoid development of VPs. Voice rest and home remedies (44%) (n = 15) were found to be the most common precautionary methods used by singers to protect their voice. More than 88% (n = 30) of the singers reported they are interested in receiving instructions regarding voice care techniques.

Since the relatively large number of singers (31 out of 34) reported VP and only three of them did not report VP, comparison of variables between the two groups could not be done. For the same reason, identification of risk factors for the development of VP among singers could not be analyzed. For the analysis of voice problems experienced by Yakshagana actors, they were divided into two groups: actors with voice problems (AWVPs) and actors with no voice problem (AWNVPs). Further, the influence of different independent variables in reporting of voice problems by Yakshagana actors was analyzed using Pearson chi-square test.

Demographic, occupation, and training-related details of Yakshagana actors

As shown in Tables 1 and 2, more than 50% of the actors were between the age range of 26 and 50 years with more than 10 years of experience in Yakshagana acting and had education up to matriculation. Most of them (>60%) perform Yakshagana shows for more than 6 months per year, on average, 4–7 shows per week. More than 80% of the actors reported they needed to raise their voice against background noise during their performance. Around 40% of the actors in both groups reported they work in other professions and approximately 10% of them needed to use their voice extensively. Pearson chi-square test did not reveal any significant difference ($P > 0.05$) between the two groups for demographic, occupation, and training-related variables.

Prevalence and nature of self-reported VPs in Yakshagana actors

Around 74% of the Yakshagana actors reported experiencing VPs at some point of time in their career. Among these, 47% (n = 45) of the singers reported experiencing vocal symptoms at least once in 6 months, 16% (n = 15) once in 2–3 months, and 5% (n = 5) as frequently as once a week since last year. The onset of VP was sudden for 35% (n = 33), gradual for 31% (n = 29), and intermittent for 11% (n = 10) of actors. The VP was getting worse

TABLE 1.
Comparison of Demographic and Occupation-related Details Between AWVP and AWNVP

Demographic Details of Yakshagana Actors			AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	degrees of freedom (df)	*P* Value
Age	18–25		8.6 (6)	24.0 (6)	4.618	3	0.202
	26–50		57.1 (40)	52.0 (13)			
	51–75		31.4 (22)	24.0 (6)			
	76–90		2.9 (2)	0.0 (0)			
Education	1st to 10th		67.1 (47)	68.0 (17)	2.487	3	0.478
	12th standard		15.7 (11)	12.0 (3)			
	Graduate		7.1 (5)	16.0 (4)			
	Postgraduate and above		10.0 (7)	4.0 (1)			
Type of Yakshagana	Badagatittu /baɖagatiʈʈu/		24.3 (17)	40.0 (10)	2.667	2	0.263
	Tenkutittu /eŋkutiʈʈu/		70.0 (49)	52.0 (13)			
	Both		5.7 (4)	8.0 (2)			
Experience	<10 y		20.0 (14)	36.0 (9)	2.570	1	0.109
	>10 y		80.0 (56)	64.0 (16)			
Number of months of performance in a year	<6 mo		35.7 (25)	40.0 (10)	0.145	1	0.703
	>6 mo		64.3 (45)	60.0 (15)			
Number of open stage performances in a year	<100 shows		41.4 (29)	28.0 (7)	1.411	1	0.235
	>100 shows		58.6 (41)	72.0 (18)			
Number of days of performance in a week	<2 d		12.9 (9)	24.0 (6)	1.720	1	0.190
	>2 d		87.1 (61)	76.0 (19)			
Number of hours of performance a day	<2 h		70.0 (49)	72.0 (18)	0.035	1	0.851
	>2 h		30.0 (21)	28.0 (7)			
Age of beginning Yakshagana acting	<15 y		41.4 (29)	40.0 (10)	0.016	1	0.901
	>15 y		58.6 (41)	60.0 (15)			
Type of roles performed	Male	Yes	77.1 (54)	84.0 (21)	0.521	1	0.470
		No	22.9 (16)	16.0 (4)			
	Female	Yes	31.4 (22)	44.0 (11)	1.284	1	0.257
		No	68.6 (48)	56.0 (14)			
	Demon	Yes	12.9 (9)	4.0 (1)	1.534	1	0.215
		No	87.1 (61)	96.0 (24)			
	King	Yes	21.4 (15)	16.0 (4)	0.339	1	0.560
		No	78.6 (55)	84.0 (21)			
	Comedian	Yes	15.7 (11)	12.0 (3)	0.202	1	0.653
		No	84.3 (59)	88.0 (22)			
Restriction in opening mouth or breath intake or speaking due to ornaments or cloths	Yes		24.3 (17)	8.0 (2)	3.054	1	0.081
	No		75.7 (53)	92.0 (23)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

for 16% (n = 15) of actors. The VP on the day of the survey was found to be in 39% (n = 37) of the actors and 15% (n = 14) of them considered it to be mild, 17% (n = 16) considered it to be moderate, and 2% (n = 2) considered it to be a severe degree in severity.

Similar to singers, around 26% (n = 25) of actors reported they canceled their participation in Yakshagana shows due to VPs. About 13% (n = 12) cancelled 3–5 shows, 8% (n = 8) cancelled 1–2 shows, and 4% (n = 4) cancelled 10–15 shows in a year. When these actors were asked to describe their quality of voice during the past 6 months, 3% (n = 3) described it as bad, 23% (n = 22) described it as average, 66% (n = 63) considered their voice as good, and about 7% (n = 7) considered it to be very good. Fifty-seven percent of actors reported that the combined effect of loud talking, continuous talking, loud talking against background noise, reduced sleep, and constant traveling could be contributing factors to the development of VPs.

Vocal symptoms experienced by Yakshagana actors

The prevalence of vocal symptoms experienced by actors is shown in Table 3. As shown in Table 3, the prevalence of vocal symptoms such as hoarseness or change in the voice quality, discomfort in the throat, shortness of breath, trouble speaking loudly, and effortful production of voice was found to be significantly higher ($P < 0.05$) in AWVP than AWNVP. Further, even though statistically not significant, it can also be seen that the prevalence of symptoms such as vocal fatigue and tightness in the throat was marginally higher in AWVP than AWNVP. Further, both groups of actors reported a higher prevalence of dryness of the throat and AWVP had a higher prevalence of vocal fatigue.

TABLE 2.
Comparison of Training-related Details Between AWVP and AWNVP

Training-related Details of Yakshagana Actors			AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	df	*P* Value
Yakshagana acting training	Yes		47.1 (33)	64.0 (16)	2.096	1	0.148
	No		52.9 (37)	36.0 (9)			
Years of acting training	<2 y		94.3 (66)	92.0 (23)	0.163	1	0.687
	>2 y		5.7 (4)	8.0 (2)			
Rehearsals every day	Yes		41.4 (29)	58.6 (11)	0.050	1	0.823
	No		58.6 (41)	56.0 (14)			
Duration of practice	<30 min		77.1 (54)	76.0 (19)	0.014	1	0.907
	>30 min		22.9 (16)	24.0 (6)			
Warm up exercises before performing	Yes		25.7 (18)	44.0 (11)	2.904	1	0.088
	No		74.3 (52)	56.0 (14)			
What warm up exercises?	Humming	Yes	4.3 (3)	4.0 (1)	0.004	1	0.951
		No	95.7 (67)	96.0 (24)			
	Tongue and lip trills	Yes	1.4 (1)	0.0 (0)	0.361	1	0.548
		No	98.6 (69)	100.0 (25)			
	Pitch gliding	Yes	21.4 (15)	40.0 (10)	3.277	1	0.070
		No	78.6 (55)	60.0 (15)			
	Others	Yes	2.9 (2)	0.0 (0)	0.730	1	0.393
		No	97.1 (68)	100.0 (25)			
Cool down exercises after performing	Yes		7.1 (5)	4.0 (1)	0.308	1	0.579
	No		92.9 (65)	96.0 (24)			
What cool down exercises?	Humming	Yes	4.3 (3)	0.0 (0)	1.106	1	0.293
		No	95.7 (67)	100.0 (25)			
	Tongue and lip trills	Yes	1.4 (1)	0.0 (0)	0.361	1	0.548
		No	98.6 (69)	100.0 (25)			
	Pitch gliding	Yes	0.0 (0)	8.0 (2)	5.720	1	0.017
		No	100.0 (70)	92.0 (23)			
	Others	Yes	5.7 (4)	0.0 (0)	1.491	1	0.222
		No	94.3 (66)	100.0 (25)			
Job in addition to singing	Yes		41.4 (29)	40.0 (10)	0.016	1	0.901
	No		58.6 (41)	60.0 (15)			
Other profession involve extensive voice usage	Yes		14.3 (10)	12.0 (3)	0.081	1	0.775
	No		85.7 (60)	88.0 (2)			
Required involve in singing	Yes		40.0 (28)	56.0 (14)	1.912	1	0.167
	No		60.0 (42)	44.0 (11)			
How often are you required to involve in singing?	NR		60.0 (42)	44.0 (11)	5.615	3	0.132
	Never		0.0 (0)	0.0 (0)			
	Rarely		27.1 (19)	28.0 (7)			
	Sometimes		10.0 (7)	28.0 (7)			
	Often		2.9 (2)	0.0 (0)			
	Always		0.0 (0)	0.0 (0)			
Background noise during performance	Yes		97.1 (68)	96.0 (24)	0.079	1	0.779
	No		2.9 (2)	4.0 (1)			
How noisy do you think is the environment during the performance	NR		4.3 (3)	4.0 (1)	4.812	4	0.307
	Soft		14.3 (10)	24.0 (6)			
	Moderate		67.1 (47)	48.0 (12)			
	Loud		11.4 (8)	24.0 (6)			
	Very loud		2.9 (2)	0.0 (0)			
Need to raise voice against background music	Yes		88.6 (62)	80.0 (20)	1.146	1	0.284
	No		11.4 (8)	20.0 (5)			
Use of amplification devices during the performance	Yes		95.7 (67)	88.0 (22)	1.853	1	0.173
	No		4.3 (3)	4.3 (12)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

TABLE 3.
Comparison of Vocal Symptoms Between AWVP and AWNVP

Vocal Symptoms in Yakshagana Actors		AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	df	*P* Value
Hoarseness or change in voice quality	Yes	47.1 (33)	24.0 (6)	4.077	1	0.043
	No	52.9 (37)	76.0 (19)			
Reduced pitch range or trouble in changing pitch	Yes	35.7 (25)	24.0 (6)	1.150	1	0.284
	No	64.3 (45)	76.0 (19)			
Dryness in the throat	Yes	72.9 (51)	64.0 (16)	0.695	1	0.404
	No	27.1 (19)	36.0 (9)			
Vocal fatigue	Yes	72.9 (51)	52.0 (13)	3.645	1	0.056
	No	27.1 (19)	48.0 (12)			
Tightness in the throat	Yes	31.4 (22)	12.0 (3)	3.586	1	0.058
	No	68.6 (48)	88.0 (22)			
Momentary loss of voice or pitch breaks	Yes	24.3 (17)	16.0 (4)	0.734	1	0.391
	No	75.7 (53)	84.0 (21)			
Discomfort in the throat	Yes	37.1 (26)	4.0 (1)	9.946	1	0.002
	No	62.9 (44)	96.0 (24)			
Pain in the throat	Yes	20.0 (14)	8.0 (2)	1.894	1	0.169
	No	80.0 (56)	92.0 (23)			
Reduced breath support or shortness of breath	Yes	27.1 (19)	8.0 (2)	3.920	1	0.048
	No	72.9 (51)	92.0 (23)			
Complete loss of voice	Yes	7.1 (5)	4.0 (1)	0.308	1	0.579
	No	92.9 (65)	96.0 (24)			
Trouble speaking loudly	Yes	95.7 (25)	12.0 (3)	4.984	1	0.026
	No	64.3 (45)	88.0 (22)			
Effortful production of voice	Yes	37.1 (26)	12.0 (3)	5.491	1	0.019
	No	62.9 (44)	88.0 (22)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

Phonotraumatic behaviors in Yakshagana actors

Phonotraumatic behaviors such as clearing throat and giving their performances when there are throat infections were found to be significantly ($P < 0.05$) higher in AWVP compared with AWNVP. Even though there was no statistically significant difference observed in reporting other phonotraumatic behaviors between the two groups of actors, a relatively higher percentage of AWVP reported they speak loudly, speak with a fast rate of speech, cough frequently, and perform in Yakshagana shows when they are physically unwell than AWNVP. The comparison of phonotraumatic behaviors between the two groups of actors (AWVP and AWNVP) is shown in Table 4.

Lifestyle and health-related factors

The lifestyle and health-related issues of Yakshagana actors are shown in Tables 5 and 6, respectively. No significant difference ($P > 0.05$) was observed between AWVP and AWNVP with respect to lifestyle and health-related factors. Most of Yakshagana actors reported they do not smoke and eat tobacco or betel leaf; however, those who smoke and eat tobacco or betel leaf regularly reported experiencing VP. Further, only one actor reported consuming alcohol daily and the rest of them reported they consume once in a month or less frequently. Most of the actors (around 80%) in both groups reported drinking more than eight glasses of water per day. Marginally higher percentage of AWVP reported experiencing dry mouth or throat, acid reflux or heart burn, stress related to their profession compared with AWNVP. Very few actors in both groups reported respiratory-related problems, but actors who reported having asthma also reported experiencing VPs. A relatively higher percentage of AWVP reported they take medications (for diabetes mellitus, blood pressure, acidity, cough, cold) compared with AWNVP.

Effect of VPs and voice care in AWVP

Around 53% (n = 37) missed work for 2–3 days, whereas 33% (n = 23) of the AWVP reported they never missed their performance due to VP. The effect of VP was found to be severe in 6% of the actors who missed performance for more than 2 weeks due to VP. The effect of VP on social interaction and the telephonic conversation was found to be very minimal. With respect to vocal health, 14% (n = 10) of AWVP reported they consulted general physician or otorhinolaryngologist specialist or SLP for their VP. Around 34% (n = 24) of AWVP reported they received specific instructions for their voice care, and 20% (n = 14) AWVP received voice care instructions from singing teachers followed by 7% (n = 5) AWVP from ENT specialist and one AWVP received it from SLP and one from a general physician. Further, when asked what precautions they take to maintain their voice, 53% (n = 37) AWVP reported they take some home remedies, 46% (n = 32) of AWVP reported they take voice rest, 30% (n = 21) of AWVP reported they drink hot water and none of them followed any vocal exercises. Further, when asked whether

TABLE 4.
Comparison of Phonotraumatic Behaviors Between AWVP and AWNVP

Vocal Abusive Behaviors Reported by Yakshagana actors		AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	df	*P* Value
Loud speaking	Yes	41.4 (29)	28.0 (7)	1.411	1	0.235
	No	58.6 (41)	72.0 (18)			
Conscious altering of voice or speech	Yes	17.1 (12)	20.0 (5)	0.102	1	0.749
	No	82.9 (58)	80.0 (20)			
Speak fast or run out of air	Yes	25.7 (18)	16.0 (4)	0.977	1	0.323
	No	74.3 (52)	84.0 (21)			
Excessive talking	Yes	35.7 (25)	36.0 (9)	0.001	1	0.980
	No	64.3 (45)	64.0 (16)			
Throat clearing	Yes	42.9 (30)	12.0 (3)	7.737	1	0.005
	No	57.1 (40)	88.0 (22)			
Frequent coughing	Yes	24.3 (17)	8.0 (2)	3.054	1	0.081
	No	75.7 (53)	92.0 (23)			
Perform during throat infections	Yes	64.3 (45)	40.0 (10)	4.457	1	0.035
	No	35.7 (25)	60.0 (15)			
Perform while physically unwell	Yes	37.1 (26)	28.0 (7)	0.679	1	0.410
	No	62.9 (44)	72.0 (18)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

they are interested to take any preventive voice care guidelines, 87% (n = 61) of AWVP and 72% AWNVP (n = 18) showed their interest in receiving voice care guidelines.

Risk factors associated with VPs in Yakshagana actors

The association between actors reporting VP and different variables influencing VPs was assessed using adjusted (using Wald forward selection criteria) OR with 95% CI. When adjusted for age and years of experience, only frequent throat clearing (OR 6.2 [95% CI 1.6; 23.7]) was found to be a significant risk factor associated with higher prevalence of self-reported VPs in Yakshagana actors.

DISCUSSION

Yakshagana is a combination of singing, dance, and acting. Each Yakshagana troupe consists of 15–20 actors and 2–3 singers; hence, the present study could obtain data from a relatively large number of Yakshagana actors compared with that of singers. Traditionally, Yakshagana is male-dominated folk art and almost all regular Yakshagana troupes include male actors and singers. In recent years, there are a few women who are involved in Yakshagana play as a hobby; however, they are not involved in regular shows. Due to this reason, the present study obtained data from only male participants.

Demographic and vocational information of Yakshagana artists

The majority (>50%) of the actors and singers were found to be within the age range of 26–50 years. However, around 32% actors were more than 50 years of age compared with only 17% of the singers. The reason for this is not known and further understanding is needed in terms of retirement age among singers and actors. Most of the singers (71%) and actors (82%) have reported education up to higher secondary level. This supports the notion that most of the Yakshagana artists get into this profession due to their unique interest, and educational level of the individual is not a barrier to get into this profession.

In the present study, it was observed that 80% of the singers and 63% of the actors reported that they perform for more than 6 months in a year and for more than 4–5 days in a week. All singers reported they sing for more than 2 hours, whereas only 29% of the actors reported they were involved in delivering dialogues for more than 2 hours. This could be because singer (*Bhagavata*) is the main character of Yakshagana and usually he narrates the story by singing. Actors dance to the music by communicating the elements of the story narrated by the *Bhagavata*. Apart from this, in one Yakshagana troupe, there will be 2 or 3 singers and more than 15–20 actors. Hence, singers need to perform for more than 2 hours in one Yakshagana show compared with actors. Further, the duration of the performance of actors varies depending on the role they played. This could be the possible reason why majority of the actors report that they perform for less than 2 hours in a Yakshagana show.

More than 90% of the singers and 52% of the actors reported they have been trained in Yakshagana singing and acting, respectively, whereas 74% of the singers and 94% of the actors reported they were involved in a training program for less than 2 years. However, this study did not inquire about the type of training they received. Previous literature suggests that these singers or actors do not receive formal, systematic training and most of the time they learn by imitating other well-established singers or actors.[13] Hence, further studies need to be done to understand the type of training received by these singers and actors during their training period. Around 60% of the singers reported they warm up their voice before singing either by humming

TABLE 5.
Comparison of Lifestyle Factors Between AWVP and AWNVP

Lifestyle Factors in Yakshagana Actors			AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	df	*P* Value
Do you have odd timings of food intake?	Yes		75.7 (53)	60.0 (15)	2.236	1	0.135
	No		24.3 (17)	40.0 (10)			
Diet involves spicy or oily food	Never		31.4 (22)	36.0 (9)	7.778	4	0.100
	Rarely		30.0 (21)	24.0 (6)			
	Sometimes		15.7 (11)	36.0 (9)			
	Often		14.3 (10)	4.0 (1)			
	Always		8.6 (6)	0.0 (0)			
Diet involves extreme hot or cold items	Never		38.6 (27)	52.0 (13)	6.833	4	0.145
	Rarely		38.6 (27)	12.0 (3)			
	Sometimes		17.1 (12)	28.0 (7)			
	Often		4.3 (3)	8.0 (2)			
	Always		1.4 (1)	0.0 (0)			
Smoking	Never smoked		90.0 (63)	80.0 (20)	5.537	3	0.136
	Used to smoke		4.3 (3)	12.0 (3)			
	Smoking intermittently		1.4 (1)	8.0 (2)			
	Smoking regularly		4.3 (3)	0.0 (0)			
Tobacco/Betel leaf chewing	Never		45.7 (32)	56.0 (14)	5.874	4	0.209
	Rarely		20.0 (14)	20.0 (5)			
	Sometimes		5.7 (4)	12.0 (3)			
	Often		4.3 (3)	8.0 (2)			
	Always		24.3 (17)	4.0 (1)			
Alcohol consumption	Yes		20.0 (14)	16.0 (4)	0.192	1	0.661
	No		80.0 (56)	84.0 (21)			
Frequency of alcohol consumption	NR		78.6 (55)	84.0 (21)	1.286	4	0.864
	Rarely		14.3 (10)	3 (12.0)			
	Once a month		2.9 (2)	0.0 (0)			
	Once a week		2.9 (2)	4.0 (1)			
	Daily		1.4 (1)	0.0 (0)			
Alcohol consumption before or after the performance	NR		0.0 (0)	4.0 (1)	3.170	2	0.205
	Yes		1.4 (1)	0.0 (0)			
	No		98.6 (69)	96.0 (24)			
Sleep disturbances	Yes		24.3 (17)	28.0 (7)	0.135	1	0.714
	No		75.7 (53)	72.0 (18)			
Hours of sleep	<2 hr		1.4 (1)	0.0 (0)	6.010	4	0.198
	3–4 hr		7.1 (5)	0.0 (0)			
	5–6 hr		67.1 (47)	60.0 (15)			
	7–8 hr		24.3 (17)	36.0 (9)			
	>9 hr		0.0 (0)	4.0 (1)			
Drink consumed often in between performance	Coffee	Yes	5.7 (4)	20.0 (5)	4.384	1	**0.036**
		No	94.3 (66)	80.0 (20)			
	Tea	Yes	70.0 (49)	84.0 (21)	1.862	1	0.172
		No	30.0 (21)	16.0 (4)			
	Water	Yes	80.0 (56)	72.0 (18)	0.685	1	0.408
		No	20.0 (14)	28.0 (7)			
No. of cups of beverages and water a day	Coffee	None	85.7 (60)	84.0 (21)	0.496	1	0.780
		<2 cups	12.9 (9)	16.0 (4)			
		>2 cups	1.4 (1)	0.0 (0)			
	Tea	None	10.0 (7)	8.0 (2)	0.223	2	0.895
		<2 cups	27.1 (19)	24.0 (6)			
		>2 cups	62.9 (44)	68.0 (17)			
	Water	<8 glasses	18.6 (13)	28.0 (7)	0.985	1	0.321
		>8 glasses	81.4 (57)	72.0 (18)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

TABLE 6.
Comparison of Health-related Issues Between AWVP and AWNVP

Health-related Factors in Yakshagana Actors		AWVP N = 70 % (n)	AWNVP N = 25 % (n)	χ^2	df	*P* Value
Asthma	Yes	5.7 (4)	0.0 (0)	1.491	1	0.222
	No	94.3 (66)	100 (25)			
Sinus problems	Yes	14.3 (10)	24.0 (6)	1.241	1	0.265
	No	85.7 (60)	76.0 (19)			
Nasal allergies	Yes	14.3 (10)	16.0 (4)	0.043	1	0.836
	No	85.7 (60)	84.0 (21)			
Frequent cold	Yes	21.4 (15)	20.0 (5)	0.023	1	0.880
	No	78.6 (55)	80.0 (20)			
Dry mouth or throat	Yes	51.4 (36)	32.0 (8)	2.797	1	0.094
	No	48.6 (34)	68.0 (17)			
Difficulty in hearing normal conversation	Yes	14.3 (10)	8.0 (2)	0.659	1	0.417
	No	85.7 (60)	92.0 (23)			
Acid reflux or heartburn	Yes	47.1 (33)	28.0 (7)	2.769	1	0.096
	No	52.9 (37)	72.0 (18)			
Stress related to your profession	Yes	28.6 (20)	12.0 (3)	2.757	1	0.097
	No	71.4 (50)	88.0 (22)			
Regular intake of medication for any problems	Yes	22.9 (16)	12.0 (3)	1.357	1	0.244
	No	71.1 (54)	88.0 (22)			

Abbreviations: AWVP, actor with voice problems; AWNVP, actor with no voice problem.

or by pitch gliding. Compared with singers, very few actors (31%) reported they warm up their voice before their show. Further, only one singer and seven Yakshagana actors reported practicing cool down exercises using humming. This finding indicates the need for educating the Yakshagana artists regarding warm up and cool down exercises to keep their voice healthy.

Prevalence of self-reported VPs

Current results highlight that there are high career and point prevalence of self-reported VPs in both singers and actors, which are consistent with the findings in the literature with respect to singers and actors.[5,18] Similar to Yakshagana singers, several studies in the literature demonstrated a higher prevalence of VPs in singers ranging between 44% and 59%.[5,18–20] Similarly, a study conducted in theater actors reported a higher prevalence of vocal fatigue after the performance and greater risk of developing VPs.[21] To date, there is no study available regarding the prevalence of self-reported VPs in Yakshagana artists. The prevalence of self-reported VPs in Yakshagana singers and actors in the present study was found to be comparatively higher than reports in the literature pertaining to actors and singers. In Yakshagana singers, this finding could be attributed to their style of singing (high pitched and loud) in the presence of high background noise (loud sound produced by the percussion instruments such as *chande*) and lack of formal singing training. Eighty percent of the singers had training in singing only for 2 years. Two years of training in Yakshagana singing may be short for them to learn all the nuances of singing. Because of this, these singers may be producing tones at the extreme limits of their range (either too low or high), causing damage to the delicate vocal structure in the long run.[22]

Similarly, Yakshagana actors need to meet unique vocal demands when they play different roles, such as they need to dance, talk, shout, grunt, sing, and move during their performances. These vocal demands are entirely different from that of theater artists. Hence, they may be more susceptible to develop VPs. According to Sataloff, extensive voice usage by amateur actors without training or premature training with improper repertoire may lead to persistent vocal difficulties later in life.[23] This could be the possible reason for Yakshagana actors reporting a higher prevalence of self-reported voice problems as they do not receive any formal training for their voice use and vocal projection. Hence, they may be more susceptible to develop VPs. Apart from this, the relatively higher percentage of singers and Yakshagana actors was found to be involved in phonotraumatic behaviors such as frequent throat clearing, performing during throat infections, and performing when physically unwell. Further, Yakshagana actors also reported loud and excessive talking. These vocal behaviors of singers and actors may put them at greater risk of developing vocal pathologies and could be the possible reasons for the higher prevalence of self-reported VPs.

Vocal symptoms and phonotraumatic behaviors experienced by singers and actors

In the present study, difficulty hitting or singing higher and lower notes, hoarseness, or breathiness especially in the higher pitch range were prevalent symptoms among Yakshagana singers, whereas vocal fatigue, hoarseness or change in voice quality, dryness of the throat, tightness in the throat, and discomfort in the throat were highly prevalent among actors, suggesting that they have symptoms of vocal fatigue. This is similar to the reports

in the literature of self-reporting symptoms in singers and actors.[1,18,21,24] The symptoms of vocal fatigue in actors will result in vocal projection difficulties, and for singers, they may result in reducing the pitch range.[25]

The present results showed certain phonotraumatic behaviors more prevalent among singers (throat clearing, performing during the presence of throat infections, performing while physically unwell) and actors (loud talking, excessive talking, throat clearing, performing during the presence of throat infections, performing while physically unwell). Loud speaking or screaming or singing for long hours in a dusty, dry surroundings (open stages, closed auditoriums) may alter secretions of the vocal fold due to dehydration or contact irritation, altering the vocal function.[23] Based on these findings, it can be assumed that the Yakshagana singers and actors are involved in hyperfunctional laryngeal behaviors. One of the earlier studies investigated the consequences of phonotraumatic behaviors (screaming, shouting, grunting, groaning and sobbing) in actors and reported that these behaviors involved extreme variations in pitch, loudness, increase in muscle tension, and sudden propulsion of air across the partially open or closed vocal folds, which could damage the vocal folds and lead to vocal symptoms.[26] Extended use of voice leads to misuse of abdominal and neck muscles, and the singers and actors experience vocal fatigue as an after effect of negative vocal adaptation.[27] This was found true in the present study with respect to Yakshagana singers and actors. Such vocal behaviors, in the long run, may lead to glottal incompetence, muscle tension dysphonia, vocal nodules, and polypoid degeneration.[1,22] Hence, the study finding signifies the need to train these Yakshagana actors with respect to phonatory behavior such as pitch and loudness control and glottal adduction while performing different roles and prevent them from developing vocal pathologies. Further studies analyzing the laryngeal mechanism in Yakshagana singers and actors may give more insights into the prevalence of self-reported VPs.

Effect of VPs and voice care

VP was the major source of frustration in 35% of singers and 17% of Yakshagana actors. Around 3%–68% (68% for 2–3 days, 12% for a week, 3% each for 2 weeks or more) of singers and 4%–42% (42% for 2–3 days, 6% for a week and 4% for more than 2 weeks) of actors missed their work for 2–3 days or more. Missing work due to VPs leads to anxiety in PVUs and adds to their VPs.[28] In the present study, the effect of VP was found to be higher in singers compared with actors. This finding indicates that Yakshagana singers have a greater impact of voice problems compared with actors. This could be attributed to the fact that singers need greater vocal flexibility in terms of pitch and intensity control, and these demands exceed the demands of speaking voice of actors.[29] Hence, minimal noticeable voice quality may have a greater impact on them.

Seeking professional help and voice care

In spite of the large numbers of singers and actors reporting VPs, and missed a performance due to VPs at a higher rate, considerably less number of singers and actors seek professional help. More than 50% of the singers and Yakshagana actors reported that they wait for a few days after the onset of vocal symptoms before they consulted the professionals. This finding is similar to that of teachers reported by other investigators.[3,30]

Apart from this, most of the Yakshagana artists believe that their voice-related problems can be better solved with home remedies. Other studies in the literature also reported that relatively less number of PVUs consult professionals for their VPs.[10,17,31,32] It can also be interpreted as the PVUs seeking help depends on the effect and their perception of the VP. Voice care knowledge includes understanding the issues related to VP, the preventive voice care measures, vocal hygiene practices, and effect of hyper functional vocal behaviors.[33] When Yakshagana artists were asked whether they have received any voice care tips, 59% of the singers and 43% of the Yakshagana actors reported in affirmative. Most of them reported they received it from singing teachers and few from medical professionals and others.

Compared with other studies related to PVUs in the literature,[7,29,34] a relatively higher percentage of Yakshagana artists reported having received voice care instructions. However, in spite of having received instructions for voice care, the prevalence of self-reported VPs was very high. Hence, this finding poses serious concern about the type of voice care instructions received by these Yakshagana artists. Greater than 80% of the singers and Yakshagana actors indicated that they are interested in receiving voice care instructions from SLPs. This finding suggests that Yakshagana artists lack an adequate understanding of voice care strategies and most of them are highly concerned about maintaining a healthy vocal mechanism. Hence, there is a clear need for further studies to understand and explore the voice care education received by these artists. Such studies may provide guidance to SLPs for designing appropriate voice care education materials.

Risk factors and their association with VPs

The present study intended to measure the association between VPs of Yakshagana artists and possible risk factors (demographic, occupational, vocal abusive, lifestyle, and health-related factors). However, this association could not be obtained for singers as there was a large difference between the two groups who were reporting VP (31 out of 34) and who were not reporting of VP (3 out of 34). Among Yakshagana actors, multiple logistic regression analysis revealed frequent throat clearing behavior having six times greater risk of developing VPs. Throat clearing causes vigorous, aperiodic adduction of the vocal folds.[28] Generally, it is believed that individuals develop this behavior in response to perceived laryngeal sensations such as dryness, tickling, burning, and lump in the throat. Hence, it could be assumed that the amount of hyper adduction involved in throat clearing could have significantly influenced the self-perceived VPs in actors.

Multiple logistic regression analysis did not show any association between other independent variables (phonotraumatic behaviors, health, and lifestyle related) with Yakshagana actors reporting of VPs. However, it is quite possible that they indirectly influenced the outcome through their association with throat clearing behavior, which can be expected in

cross-sectional study designs.[35] That is, sinus problems, frequent cold, laryngopharyngeal reflux, etc., can cause throat irritation and thus they may induce frequent throat clearing. However, to our knowledge, this is the first study conducted in Yakshagana artists to understand the risk factors influencing VPs, and further studies are needed with respect to different independent variables that are considered in the literature having influence in developing VPs in PVUs.

It is a well-known fact that the vocal organ is vulnerable to damage due to multiple etiological factors.[28] In PVUs, phonotraumatic behaviors (loud talking, yelling, screaming, hard glottal attacks, singing or speaking outside acceptable physiological range, speaking in a noisy environment, excessive talking, throat clearing, loud or abusive laughing, and speaking or singing in the presence of throat infections), exposure to variety of substances (alcohol consumptions, medication, caffeine, recreational drugs, smoke, reflux of stomach contents), psychogenic factors causing increased musculoskeletal tension, and work environment factors (poor room acoustics, poor air quality of air, poor working postures) are recognized to have significant influence on the development of VPs.[36,37]

Even though the present study could not assess the relationship between different risk factors to the reporting of VPs in singers, from the self-reported data of singers it can be seen that they experience vocal loading effects other than Yakshagana singing. For example, 47% of the singers reported they need to frequently deliver dialogues in between singing and 71% of them reported they need to raise their voice against background noise. Other than this, relatively higher percentage of singers reported that they clear their throat often (35%), perform during throat infections (82%), perform while physically unwell (35%), odd timings of food intake (47%), sinus problems (21%), nasal allergies (21%), dry mouth and throat (38%), acid reflux (41%), and stress related to profession. These factors might have had a significant effect on singers reporting a higher prevalence of self-reported VPs.

Overall, the findings of the present study have shown that Yakshagana artists as a group of PVUs are at greater risk of developing VPs. This is probably the first study reporting the prevalence of self-reported VPs in singers and Yakshagana actors. Higher prevalence of self-reported VPs experienced by these PVUs emphasizes the dire need to educate them regarding early symptoms of vocal fatigue or VPs and how to prevent themselves from developing permanent VPs. They need to be educated about the importance of early intervention for better results and to prevent them from developing serious problems. In addition, to make this work more effective, it is also necessary to convince the troupe managers about the consequences of VPs on the performance and productivity of the singers and actors.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.jvoice.2017.09.010.

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