

Prevalence of and Risk Factors for Self-reported Voice Problems Among Hindu Temple Priests

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Summary: Background. Hindu priests (purohits/purohitis/) perform religious services, rites, and prayers primarily at the temples, during which there is a continuous recitation of shlokas, jlokas, and mantras/mæntṛas/ in a loud voice. Hence, the voice is the primary component of priests' profession and earning for livelihood. The present study was conducted to explore the prevalence and possible risk factors, and the impact of voice problems (VPs) in Hindu temple priests.

Methods. This cross-sectional survey was conducted by distributing the self-reporting questionnaires to 140 Hindu temple priests in and around the Udupi/udupi/ and Mangaluru/mangalu:ru/ districts of Karnataka state, India, between January and April 2016.

Results. The Hindu temple priests were found to have high career (43%) and point (19%) prevalence rates of VP. The length of work experience as a priest (>10years), modification of voice during chanting, speaking or chanting in the presence of throat infection, and experiencing dry mouth and throat were some of the risk factors found to have a significant association with high prevalence of self-reported VPs in priests. Around 43% of the priests missed their work at least 2–3 days because of VP.

Conclusions. Overall, the results of this study reveal a high prevalence of self-reported VPs in Hindu priests and suggest that VPs are associated with different risk factors. Further studies are needed to focus on understanding the impact of VPs and to develop awareness about preventive vocal measures in this population.

Key Words: Voice problem—Prevalence—Hindu temple priests—Professional voice users—Voice.

INTRODUCTION

Occupational voice comprises all occupations for which a good, pleasant, and clear voice is a prerequisite.¹ There are many professions that can be grouped under the term professional voice users (PVUs). For example, the voice is essential for teachers, singers, actors, newsreaders, lawyers, and cheerleaders. Voice problems (VPs) are common among these PVUs, and the reported prevalence rate is very high. For instance, studies indicate prevalence rates ranging from 11% to 81% in teachers^{2–5} and 59% in singers.⁶ Like the other PVUs, the voice is a vital component of the priest's occupation, and problems in voice may have a negative impact on their profession.

A strong, loud, and clear voice is an important feature for priests because they are considered as spiritual and religious teachers, leaders, and interpreters of their faith and tradition. Few latest studies conducted in the literature in church priests, clergy, and cantors have revealed a higher prevalence of VPs in this group of PVUs. A study conducted in a group of preachers has reported a high prevalence of few vocal symptoms, such as throat clearing (78.5%), hoarseness (57.1%), and laryngeal irritation or pain (51.8%).⁷ Another study was conducted in Slovenian Catholic priests to investigate the prevalence of VPs among these priests and to identify the risk

factors for VPs.⁸ The results of the study revealed a carrier prevalence rate as high as 85.6%, and 15.9% experienced frequent VPs. Respiratory tract infection was identified as the most common cause of VPs, and the risk factors included frequent throat clearing, vocal load during free time, lack of instruction or wrong use of vocal technique, and VPs during training.⁸ A questionnaire study was conducted in Jewish cantors and the results indicated that high vocal demands, acid reflux, allergies, and reduced vocal downtime were the most common risk factors.⁹ More than 65% of the participants reported of having had VPs at some point of time in their career that interfered with their duties. The authors concluded that the Jewish cantors were at higher risk of developing VPs. Another questionnaire study was conducted to explore the prevalence of VPs and the possible risk factors associated with VPs in Lutheran priests.¹⁰ The results of the study showed a high prevalence of VPs in priests, and about 24.5% of the priests with VP had sought professional help, of which 18% reported to have VP. The point prevalence of VP was 21%, 26% of the priests had recurring vocal symptoms, and 11.6% of the priests reported to have missed work because of VPs. Female priests reported more VPs compared with male priests. Most frequently reported symptoms were coughing or throat clearing while talking, hoarseness, and strained voice. In the Indian context, a preliminary attempt was made to study the prevalence of VPs and associated risk factors in Mar Thoma priests in Kerala.¹¹ The results showed career and year prevalence rates of 47.8% and 25.2%, respectively, and 17.8% of the priests reported frequent VPs during their career. The most commonly associated risk factors in priests reporting VP included allergies, asthma, and frequent throat clearing. Significantly large number of priests missed work because of their VPs.

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Hindu temple priests (purohits/purohitis/) are regularly involved in various rituals, pooja/pu:ḍḡa/, homa/havan, weddings, and funerals, during which there is a continuous recitation of shlokas, flokas, and mantras/māntrās/ (chants) in a loud voice. These priests are trained informally from their childhood for all these practices. They are generally trained by their family members or the spiritual leaders of the community. The training concentrates around acquiring knowledge about the rituals, chants, and mantras. The priests are also given knowledge about Hindu scriptures, worshiping at temples, conducting rites, and habits, which can help them develop their own spirituality. From childhood, priests are trained to memorize Sanskrit shlokas over several years. Unlike priests in other communities, Hindu priests recite mantras or shlokas in a loud voice continuously for hours in the dusty and smoky environment against high background noise (temple bell sound). Apart from this, Hindu priests are also involved in performing other rituals, such as conducting marriage, homa and havan, which require chanting of mantras or shlokas. Thus, Hindu priests are under high vocal demands. Despite being an important group of vocal professional with high vocal demands, little is known about the prevalence of VPs in Hindu priests. Considering the high vocal demands of these professionals, it is hypothesized that there is a higher prevalence of VPs in Hindu priests. Information obtained from the present study will give a useful understanding of the vocal health and associated risk factors in this group of PVUs, which in turn will help professionals in developing vocal hygiene and vocal education programs specific to this population. Hence, the present study aimed at investigating the prevalence of VPs and associated risk factors for VPs in Hindu temple priests. The objectives of the study were to investigate (1) the prevalence of self-reported VPs in Hindu temple priests, (2) the variables associated with increased risk of VPs in these priests, and the (3) impact of VPs on these priests.

METHODS

Self-reporting questionnaire

For the current study, a self-reporting questionnaire was developed in the Kannada language based on the inputs from other similar questionnaires available in the literature for singers, priests, and news readers.^{4,8,12} 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. The SLPs were asked to give their suggestions and comments on the content of the questionnaire. They were also asked to give their comments concerning the familiarity of the terminologies used in the questionnaire and the relevance and appropriateness of the questions, and to identify any missing information. The questionnaire was modified as per the suggestions of SLPs, and the final questionnaire had 66 questions divided into the following sections: demographic-, occupation-, and training-related details, prevalence and nature of VPs, phonotraumatic behaviors, lifestyle-related factors, health-related factors, the effect of VP, and voice care (Appendix). Further, the questionnaires were distributed to five

priests for familiarity check, who were asked to indicate any difficulty or ambiguity in understanding questions, and whether researchers missed any information that is relevant to priests. In the present study, career and point prevalence rates were estimated using the following operational definitions, respectively: "Have you had any VP since you joined this profession that has prevented you from chanting shlokas/flokas/ and mantras/māntrās/ or interfered with your profession?" and "Do you have a problem with your voice today, which is preventing you from doing all you want to do?"⁴

Participants and data collection

Before data collection, All India Institute of Speech and Hearing ethical committee approval was obtained, after which the second investigator personally contacted around 140 priests working in different temples in and around the Udupi/udupi/ and Mangaluru/manḡalu:ru/ districts of Karnataka state, India. The purpose of the study was explained to the Hindu priests, and those who consented to participate in the study were given the self-reported questionnaire, along with the information sheet and the consent form. The priests who consented to participate in the study were asked to complete the questionnaire by choosing appropriate options as per the instructions and to return it to the researcher on the same day. The data were collected between January and April 2016.

Statistical analysis

Statistical analysis was done using SPSS 20.0 (Software Package for Social Sciences; IBM Corporation, Armonk, NY). Descriptive statistics were used to describe the prevalence and the demographic-, occupation-, and training-related details of the participants (age, years of experience, number of working hours per day, average talking or chanting hours per day, etc). The percentage was computed to summarize the career and point prevalence rates of VPs. Pearson chi-square test was used to analyze the difference between priests with voice problems (PWVPs) and priests with no voice problems (PWNVPs) with respect to occupation and training, vocal symptoms, phonotraumatic behaviors, lifestyle, and health-related factors. Adjusted odds ratio 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

Of 140 self-reported questionnaires distributed among priests, the response rate of 91% was obtained by collecting 128 returned questionnaires. After excluding four incomplete questionnaires, data were analyzed from 124 eligible questionnaires.

Prevalence and nature of self-reported VPs in Hindu priests

Of 124 participants, 43% ($n = 53$) reported they experienced VPs, which interfered with their profession at some point in

time in their career. Of the 53 priests who reported VPs, 72% (n = 38) reported that VPs arise once in 6 months, 11% (n = 6) reported once in 2–3 months, 9% (n = 5) reported once a month, and 8% (n = 4) reported as frequently as once a fortnight or a week. The onset of the VP was sudden for 47% (n = 25) and gradual for 53% (n = 28) of the priests. Further, 15% (n = 8) of the priests reported worsening of the vocal symptoms since the onset. The severity was rated mild by 55% (n = 29), moderate by 40% (n = 21), and severe by 6% (n = 3). When the priests were asked to rate their voice quality during the past 6 months, 57% (n = 30) considered their voice quality to be good, 42% (n = 22) considered their voice quality to be average, and 2% (n = 1) considered their voice quality to be bad. The point prevalence of VP was found to be around 19% (n = 24). Based on priests reporting VPs and no VPs, the priests were divided into two groups, and the independent variables, such as demographic-, occupation-, training-, lifestyle-, and health-related factors, were compared between the two groups using the Pearson chi-square test with 95% CI.

Demographic, occupation, and training-related details of priests

The mean age of the participants was 34.4 years (range 18–75 years), with 23 priests older than 50 years of age. For better analysis, the priests were divided into three age groups: young adults (18–25 years), middle-aged (26–50 years), and older age (>50 years). The lowest education obtained was up to 10th standard (41%), and the highest education obtained was Master of Sanskrit (37%), and 13% and 9% of the priests had education up to preuniversity and graduation levels, respectively. Majority of the participants (73%) were working as priests full time, and 27% of them worked part-time as priests. The comparison of demographic-, occupation-, and training-related details between PWVPs and PWNVPs is shown in Table 1.

As shown in Table 1, priests between 26 and 50 years with more than 10 years of work experience reported VPs at a

significantly higher rate. More than 50% of the priests (PWVPs and PWNVPs) reported using their voice in their profession for more than 3 h/d, out of which 28% of PWVPs and 21% of PWNVPs reported using their voice at a stretch for 3 hours or more per day. Around 32% of PWVPs and PWNVPs reported they work in other professions, and 18% reported they need to use their voice in another profession. Majority of the priests in both groups reported they are involved in homa or havan for more than two to three times per week for a duration of 2–4 hours (Table 1).

Vocal symptoms experienced by priests after chanting or speaking

Further, priests were asked to indicate whether they experience any of the vocal symptoms listed in the questionnaire during or after chanting. Figure 1 shows the comparison of the frequency of vocal symptoms between the two groups of priests. Hoarseness of voice [χ^2 (1, N = 95) = 24.264, $P < 0.01$], dryness of the throat [χ^2 (1, N = 95) = 6.883, $P < 0.01$], vocal fatigue [χ^2 (1, N = 95) = 15.982, $P < 0.01$], tightness in the throat [χ^2 (1, N = 95) = 4.771, $P < 0.05$], momentary loss of voice or pitch breaks [χ^2 (1, N = 95) = 5.767, $P < 0.05$], discomfort in the throat [χ^2 (1, N = 95) = 7.073, $P < 0.05$], shortness of breath [χ^2 (1, N = 95) = 8.778, $P < 0.05$], and trouble with speaking loudly [χ^2 (1, N = 95) = 20.036, $P < 0.01$] were reported at a significantly higher rate by PWVPs than by PWNVPs. Other vocal symptoms, such as pain in the throat [χ^2 (1, N = 95) = 0.036, $P > 0.05$] and complete loss of voice [χ^2 (1, N = 95) = 0.089, $P > 0.05$], were not statistically significant between the two groups of priests.

Phonotraumatic behaviors

The Hindu priests were asked to indicate whether they indulge in any of the listed phonotraumatic behaviors. The responses obtained (PWVPs and PWNVPs) are

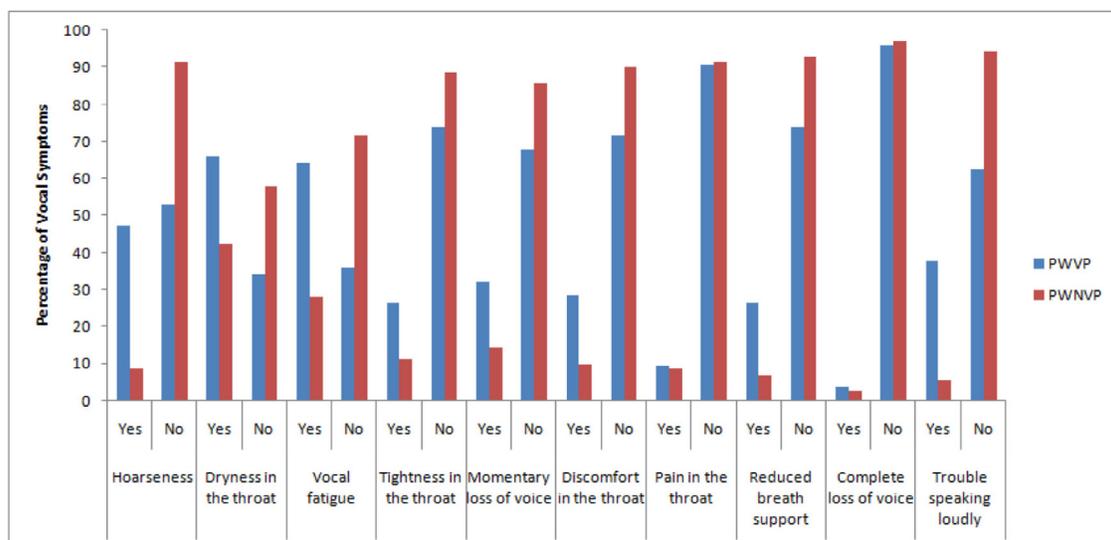


FIGURE 1. Comparison of frequency of vocal symptoms between priests with and without voice problems.

TABLE 1.
Comparison of Demographic-, Occupation-, and Training-related Details Between PWVPs and PWNVPs

Demographic- and Training-related Details of Hindu Priests		PWVP	PWNVP	Chi-square	df	P Value
		N = 53	N = 71			
		% (n)	% (n)			
Age	18–25	22.6 (12)	49.3 (35)	11.990	3	0.007
	26–50	56.6 (30)	33.8 (24)			
	51–75	20.7 (11)	16.9 (12)			
Type of work as priest	Full time	75.5 (40)	70.4 (50)	0.389	1	0.533
	Part time	24.5 (13)	29.6 (21)			
Occupation-related details						
Experience as a priest (y)	<10	45.3 (24)	67.6 (48)	6.210	1	0.013
	>10	54.7 (29)	32.4 (23)			
Work (h/d)	<3	34.0 (18)	43.7 (31)	1.195	1	0.274
	>3	66.0 (35)	56.3 (40)			
Continuous chanting (h/day)	<3	71.7 (38)	78.9 (56)	0.852	1	0.356
	>3	28.3 (15)	21.1 (15)			
Received training	Yes	94.3 (50)	95.9 (61)	2.295	1	0.130
	No	5.7 (3)	14.1 (10)			
Duration of training (y)	<2	22.6 (12)	32.4 (23)	1.425	1	0.233
	>2	77.4 (41)	67.6 (48)			
Age at the beginning of training (y)	<15	52.8 (28)	47.2 (25)	1.042	1	0.307
	>15	47.2 (25)	38.0 (27)			
Additional job	Yes	32.1 (17)	32.4 (23)	0.001	1	0.970
	No	67.9 (36)	67.6 (48)			
Other profession involving extensive voice usage	Yes	18.9 (10)	16.9 (12)	0.080	1	0.777
	No	81.1 (43)	83.1 (59)			
Indulge in singing or mimicry	Yes	32.1 (17)	18.3 (13)	3.135	1	0.077
	No	67.9 (36)	81.7 (58)			
Background noise in the work environment	Yes	64.2 (34)	59.2 (42)	0.319	1	0.572
	No	35.8 (19)	40.8 (29)			
How noisy do you think is the environment during the performance?	Soft	11.3 (6)	14.1 (10)	6.462	4	0.167
	Moderate	73.5 (39)	77.4 (55)			
	Loud	13.2 (7)	8.4 (6)			
	Very loud	1.9 (1)	0.0 (0)			
Need to raise voice against background music	Yes	49.1 (26)	36.6 (26)	1.928	1	0.165
	No	50.9 (27)	63.3 (45)			
Involvement in homa and havan	Yes	86.8 (46)	76.1 (54)	2.241	1	0.134
	No	13.2 (7)	23.9 (17)			
Frequency of involvement in homas	Rarely	15.1 (8)	22.5 (16)	4.807	4	0.308
	Once/wk	13.2 (7)	23.9 (17)			
	2–3 times/wk	26.4 (14)	16.9 (12)			
	4–5 times/wk	28.3 (15)	25.4 (18)			
	Everyday	17.0 (9)	11.3 (8)			
Duration of homa (h)	<1	16.9 (9)	26.7 (19)	3.273	4	0.351
	2–4	67.9 (36)	66.2 (47)			
	5–6	15.1 (8)	7.0 (5)			
	7–8	0.0	0.0			
	>9	0.0	0.0			

Note: Boldfaced values indicate significant difference.
 Abbreviation: df, degrees of freedom.

shown in Table 2. As shown in Table 2, PWVPs were found chanting with a loud voice, modifying pitch while chanting, having increased rates of speech while chanting, having frequent coughing, chanting mantras during throat infections, and modifying voice while chanting (pitch and loudness) at a significantly higher rate compared with PWNVPs. However, there was no significant difference

between the two groups of priests in reporting other phonotraumatic behaviors.

Lifestyle-related factors

No significant difference in lifestyle-related factors was observed between PWVPs and PWNVPs (Table 3). Compared with PWNVPs, a relatively higher percentage of

TABLE 2.
Comparison of Phonotraumatic Behaviors Between PWVPs and PWNVPs

Phonotraumatic Behaviors Reported by Hindu Priests		PWVP	PWNVP	Chi-square	df	P Value
		N = 53	N = 71			
		% (n)	% (n)			
Speaking loudly	Yes	24.5 (13)	29.6 (21)	0.389	1	0.533
	No	75.5 (40)	70.4 (50)			
Chanting with loud voice	Yes	43.4 (23)	25.4 (18)	8.209	1	0.016
	No	56.6 (30)	74.6 (53)			
Modifying pitch while speaking	Yes	26.4 (14)	28.0 (27)	1.849	1	0.174
	No	73.6 (39)	62.0 (44)			
Modifying pitch while chanting	Yes	54.7 (29)	31.0 (22)	9.330	1	0.009
	No	45.2 (24)	69.0 (49)			
Speaking fast or running out of air while speaking	Yes	20.8 (11)	32.4 (23)	2.066	1	0.151
	No	79.2 (42)	67.6 (48)			
Increased rate of speech while chanting	Yes	20.7 (11)	8.5 (6)	8.200	1	0.017
	No	79.2 (42)	91.5 (65)			
Excessive talking	Yes	37.7 (20)	28.2 (20)	1.271	1	0.260
	No	62.3 (33)	71.8 (51)			
Throat clearing	Yes	39.6 (21)	25.4 (18)	2.867	1	0.090
	No	60.4 (32)	74.6 (53)			
Frequent coughing	Yes	20.8 (11)	0.0 (0)	16.170	1	<0.001
	No	79.2 (42)	100 (71)			
Speaking or chanting during throat infections	Yes	60.4 (32)	28.2 (20)	12.929	1	<0.001
	No	39.6 (21)	71.8 (51)			

Note: Boldfaced values indicate significant difference.
 Abbreviation: df, degrees of freedom.

PWVPs reported odd timings of food intake. The frequency of intake of caffeinated beverages was found to be very limited by the majority of the priests, and less than 20% of the priests reported drinking more than two cups of coffee or tea per day. Approximately 70% of the priests (both groups) reported they hydrate themselves with drinking more than eight glasses of water per day. Majority of the priests reported sleeping for 6–8 hours. None of the Hindu priests reported smoking cigarettes or drinking alcohol.

Health-related factors

PWVPs experienced cold, dry mouth and throat and stress related to the profession at a significantly higher rate than PWNVPs (Table 4). Other health-related problems such as asthma, sinus problems, or nasal allergies were observed to be very less common among priests. Around 25% of PWVPs and 21% of PWNVPs reported regular intake of medicine related to diabetes mellitus and blood pressure.

Effect of self-reported VPs and voice care in PWVP

Around 17% (n = 9) and 6% (n = 3) of PWVPs reported getting frustrated sometimes or very often, respectively, because of VPs. Around 43% of the priests (n = 23) missed work for 2–3 days, 8% (n = 4) missed work for a week, and around 4% (n = 2) missed work for more than 2 weeks. Missing work did contribute to financial burden in 32% of the priests (n = 17). Further, 8% of the priests (n = 4) reported mild trouble in

interacting with family and friends, interacting socially, and using the telephone because of the VP and felt the need to repeat themselves to be understood as well.

With respect to vocal health, only 17% of PWVPs (n = 9) reported they approached professionals for their VPs (ear, nose, and throat specialist, physician, or SLP), and 40% (n = 21) of PWVPs received specific instructions for voice care mostly from physicians. Most of the PWVPs (51%) indicated they rely on home remedies for their VP, followed by voice rest (47%). Further, when asked whether they are interested to take any preventive voice care guidelines, 79% (n = 42) of PWVPs showed interest in receiving voice care guidelines.

Risk factors associated with VPs in Hindu priests

The association between reporting of VPs and influencing variables was estimated using unadjusted and adjusted odds ratios with corresponding 95% CIs using multiple logistic regression analysis (Wald forward selection criteria). The variables having a significant association with reporting of VPs by the priests are shown in Table 5. As shown in Table 5, the risk of reporting VPs among priests having more than 10 years of experience was 1.7 times higher than that among priests having less than 10 years of experience. Similarly, VPs were found to be 3.1 times higher in priests changing their voice during chanting, 3.1 times higher in priests who chant during throat infections, and 2.2 times higher in priests who experience frequent dry mouth and

TABLE 3.
Comparison of Lifestyle Factors Between PWVPs and PWNVPs

		PWVP	PWNVP	Chi-square	df	P Value	
		N = 53	N = 71				
Lifestyle Factors in Hindu Priests		% (n)	% (n)				
Do you have odd timings of food intake	Yes	62.3 (33)	45.1 (32)	3.597	1	0.058	
	No	37.7 (20)	54.9 (39)				
Diet involves spicy or oily food	Never	39.6 (21)	35.2 (25)	1.079	4	0.898	
	Rarely	28.3 (15)	25.4 (18)				
	Sometimes	20.8 (11)	22.5 (16)				
	Often	7.5 (4)	12.7 (9)				
	Always	3.8 (2)	4.2 (3)				
Diet involves extremely hot or cold items	Never	58.5 (31)	42.3 (30)	6.5781	4	0.160	
	Rarely	11.3 (6)	23.9 (17)				
	Sometimes	18.9 (10)	21.1 (15)				
	Often	9.4 (5)	5.6 (4)				
	Always	1.9 (1)	7.0 (5)				
Fasting	Yes	75.5 (40)	70.4 (50)	0.389	1	0.533	
	No	24.5 (13)	29.6 (21)				
Frequency of fasting	No response	24.5 (13)	29.6 (21)	1.015	2	0.602	
	Once in 15 d	71.7 (38)	69.0 (49)				
	Once/wk	3.8 (2)	1.4 (1)				
	2 d/wk	0.0	0.0				
	3 d/wk	0.0	0.0				
	4 d/wk	0.0	0.0				
Betel leaf chewing	Never	79.2 (42)	83.1 (59)	3.523	3	0.318	
	Rarely	17.0 (9)	15.5 (11)				
	Sometimes	3.8 (2)	0.0				
	Often	0.0	0.8 (1)				
	Always	0.0	0.0				
Sleep disturbances	Yes	22.6 (12)	16.9 (12)	0.641	1	0.423	
	No	77.4 (41)	83.1 (59)				
Duration of sleep (h)	<4	1.9 (1)	0.0 (0)	4.543	4	0.337	
	5s	13.2 (7)	8.5 (6)				
	6	43.4 (23)	36.6 (26)				
	7	34.0 (18)	38.0 (27)				
	8	7.5 (4)	16.9 (12)				
Number cups of beverages and water a day	Coffee	None	75.5 (40)	5.545	2	0.063	
		<2 cups	18.9 (10)				35.2 (25)
		>2 cups	5.7 (3)				9.9 (7)
	Tea	None	34.0 (18)	36.6 (26)	0.375	2	0.829
		<2 cups	49.1 (26)	43.7 (31)			
		>2 cups	17.0 (9)	19.7 (14)			
	Water	<8 glasses	30.2 (16)	26.8 (19)	0.176	1	0.675
		>8 glasses	69.8 (37)	73.2 (52)			

Abbreviation: df, degrees of freedom.

throat than priests who do not change their voice during chanting, do not chant during throat infections, and do not experience dry mouth and throat, respectively.

DISCUSSION

Prevalence of self-reported VPs

The purpose of the present study was to determine the prevalence of VPs and associated risk factors in Hindu temple priests. The present study is the first study reporting VPs

experienced by Hindu priests as per our knowledge. The results suggest that Hindu priests are at greater risk of developing VPs with high career (43%) and point (19%) prevalence rates, thus supporting our hypothesis. Reporting of VPs was observed to be significantly higher in younger and middle-aged priests compared with older priests. The results obtained in the present study are in consonance with the findings of other studies conducted in church priests, clergy, and cantors with prevalence rates ranging from 48% to 86%.^{8,11,13} The consistently higher prevalence of VPs in

TABLE 4.
Comparison of Health-related Issues Between PWVPs and PWNVPs

Health-related Factors in Hindu Priests		PWVP	PWNVP	Chi-square	df	P Value
		N = 53	N = 71			
		% (n)	% (n)			
Asthma	Yes	13.2 (7)	8.5 (6)	0.732	1	0.392
	No	86.8 (49)	91.5 (65)			
Sinus problems	Yes	20.8 (11)	23.9 (17)	0.177	1	0.674
	No	79.2 (42)	76.1 (54)			
Nasal allergies	Yes	17.0 (9)	16.9 (12)	0.000	1	0.991
	No	83.0 (44)	83.1 (59)			
Frequent cold	Yes	47.1 (25)	28.1 (20)	5.558	1	0.018
	No	52.8 (28)	71.8 (51)			
Dry mouth or throat	Yes	47.2 (25)	25.4 (18)	6.377	1	0.012
	No	52.8 (28)	74.6 (53)			
Difficulty in hearing normal conversation	Yes	15.1 (8)	14.1 (10)	0.025	1	0.875
	No	84.9 (45)	85.9 (61)			
Acid reflux or heartburn	Yes	34.0 (18)	21.1 (15)	2.560	1	0.110
	No	66.0 (35)	78.9 (56)			
Stress related to your profession	Yes	35.8 (19)	8.5 (6)	14.152	1	<0.001
	No	64.2 (34)	91.5 (65)			
Regular intake of medication for any problems	Yes	24.5 (13)	21.1 (15)	0.201	1	0.654
	No	75.5 (40)	78.9 (56)			

Abbreviation: df, degrees of freedom.

priests from different studies in the literature indicates that priests are at higher risk of developing VP irrespective of which religion they preach. This finding could be attributed to the higher vocal demands, such as prolonged loud chanting, religious teaching, or counseling in the presence of background noise (bell sound in the temple).^{13–17} Apart from this, Hindu priests need to chant in the presence of smoke (homa or havan), which may irritate their laryngeal mucosa and may increase coughing, throat clearing, and vocal loading.

Dryness in the throat, vocal fatigue, hoarseness or change in the voice quality, trouble with speaking loudly, tightness in the throat, momentary loss of voice or pitch breaks, discomfort in the throat, and shortness of breath were some of the prevalent symptoms reported by Hindu priests. The results of the present study are in consensus with the findings of other studies conducted in priests.^{10,13} Altered pitches, sore throat, vocal fatigue, and tightness in the throat are

warning signs of vocal attrition.¹⁸ Hindu priests often alter their voice in terms of increased loudness, pitch, and rate while chanting, which could put them at risk of developing VPs, as these behaviors require increasing the subglottal pressure with a greater degree of glottal adduction.^{19–23} Indulging in nonvocal behaviors such as clenching of teeth and excessive tensing of the jaw and neck muscles could exert more pressure on the laryngeal muscles and could lead to early fatigue.¹⁴ Extended voice use over a period of time leads to misuse of the neck and abdominal muscles, faulty respiratory dynamics, irritation of the larynx, and increased laryngeal muscle tension, which may lead to organic lesions (vocal nodules) in PVUs.¹⁷ The higher prevalence of these symptoms among priests reported in the literature is attributed to excessive voice use in inappropriate acoustic environments and respiratory-related problems.⁸ Hence, it can be presumed that the prolonged and intensive voice use by Hindu priests while performing rituals leads to

TABLE 5.
Unadjusted and Adjusted Odds Ratio Values for Different Risk Factors in PWVPs*

Factors Having a Significant Association With Priests Reporting of VPs	Unadjusted Odds Ratio (95% CI)	P Value	Adjusted Odds Ratio (95% CI)	P Value
Experience as a priest (y)				
<10	1.00		1.00	
>10	2.522 (1.210–5.257)	0.014	1.739 (1.072–2.948)	0.025
Need to change voice during chanting	3.000 (1.266–7.106)	0.013	3.135 (2.162–4.639)	0.011
Speaking and chanting during throat infections	3.886 (1.826–8.269)	<0.001	3.125 (2.152–5.538)	<0.001
Experiencing dry mouth and throat	2.629 (1.230–5.618)	0.013	2.287 (1.048–5.015)	0.039

* Adjusted for years of experience.

phonotraumatic behaviors and that these priests are at higher risk of developing hyperfunctional vocal pathologies. The higher prevalence of VPs reported in the current study calls for attention to alert Hindu priests about the early symptoms of vocal attrition and how to prevent the development of hyperfunctional vocal pathologies.

Risk factors

Factors contributing to the development of VPs, such as gender, vocal loading, phonotraumatic behaviors, lifestyle, and psychological and environmental factors, are reported to be multifactorial in etiology.^{8,14,24–27} The present study included only male priests as this profession in Hindu culture is dominated by the male gender. The present study investigated the possible risk factors in Hindu priests reporting of VPs using multiple logistic regression analysis. Logistic regression analysis revealed a significant association between work experience for more than 10 years, changing voice during chanting, speaking and chanting during throat infections, and experiencing dry mouth and throat in Hindu priests reporting of VPs.

There was a significant relationship between self-reporting of VPs and length of time working as a priest (>10 years), suggesting that Hindu priests are at greater risk of developing VPs as they continue in their profession for a long time. The current findings are in contrast with the reports of primary school teachers^{2,28} and Slovenian Catholic priests,⁸ where years of work experience was not found to be a risk factor associated with self-reporting of VPs. Hindu priests are involved in reciting prayers and chanting mantras during their entire service with a loud volume and varied pitches. This could lead to vocal abuse and hyperfunctional voice production. This was found true in the present study as varying their voice during chanting was having a significant association with reporting of VPs.

Speaking or chanting during throat infections was another important factor found to have a significant association with Hindu priests reporting VPs. Respiratory tract infection was reported to be the most common cause of VPs among Slovenian priests.⁸ Priests who were involved in talking or singing during throat infections were also found to have a greater risk of VP in the literature.²⁹ Excessive voice use during throat infections can lead to gradual vocal fold tissue changes.^{30,31} Also, the presence of throat infections could irritate the laryngeal and pharyngeal walls to a greater extent and may lead to VPs. Upper respiratory tract infection can cause laryngitis, which stiffens the superficial layer of the vocal cords. Repeated use of the voice in the presence of laryngitis leads to inflammation of the vocal cords and impairs voice production. This, in turn, increases the need to put extra effort to speak and vocal fatigue sets in.^{32,33} Further, there is a chance that these priests are prone to frequent upper respiratory tract infection because of their requirement of taking cold water shower early in the morning. They also begin their everyday rituals while in their damp clothes. They travel to different places constantly to perform the rituals. They are also exposed to smoke from

the *homa/homa*, which could irritate the nasal mucosal lining, as well as the vocal tract.

The viscoelasticity of the vocal fold mucosa depends on the level of vocal fold hydration.³⁴ Dehydration or dryness of the mouth and throat leads to an increase in the stiffness and viscosity of the vocal folds. Increased viscosity leads to elevated friction and heat dissipation during the vibration of vocal fold and thus requires a greater amount energy to initiate and sustain the phonation.^{35–38} Stress related to the profession was another factor reported by the priests, which needs attention even though it did not show its correlation with the reporting of VPs by the priests. Under stressful conditions, even though the vocal folds may be free of pathology, the precision of movement of the vocal folds may be adversely affected by the emotions and the state of mind of the owner of the voice.³⁹ Breathless voice, double voice, dry mouth and throat, harshness, hoarseness, high pitch or low pitch, elevated larynx, loud voice, monotone, aphonia, neck or throat pain, pitch breaks, shortness of breath, strained voice, throat clearing, tight voice, voice breaks, weak voice, and traumatic laryngitis are some of the vocal symptoms associated with stress.²⁴

Impact of VP and voice care

A significant number of Hindu priests were affected by the presence of VPs, as the VPs hindered their job. Voice is the major component of priests' occupation, and hence, VPs will have a negative effect on their income.⁴⁰ This finding was found true in the present study, where the majority of the Hindu priests (72.5%) depended on their preaching for their livelihood and 32% of the Hindu priests reported missing work, which caused the financial burden. Hence, most of the time, the PVUs do not consider VP as an excuse for missing work, and they take off from work only when their condition does not let them carry out their work.⁴¹ In the present study, we found that 43% of the priests missed work for 2–3 days, 8% missed work for a week, and 4% missed work for more than 2 weeks because of their VPs. Missing of work because of VPs in Hindu priests was found to be higher like that of teachers. This could be attributed to priests reporting of frequent attacks of upper respiratory tract infections. Respiratory tract illness increases the vocal fatigue and limits vocal performance as priests need to recite mantras or shlokas continuously.⁸ Missing work because of VPs may have a significant impact on the psychological well-being of a PVU.⁴² The psychosocial impact may be relatively higher in Hindu priests as they cannot hand over some of the work tasks to other priests and cannot postpone their daily rituals. Further, in Hindu religion, the date and time of rituals matter a lot. Hence, even though they may have a throat infection, priests give a lot of importance to completing the rituals on time. Hence, it is important to sensitize Hindu priests about causes of VPs, early signs of vocal attrition, and methods of good vocal hygiene to prevent them from developing serious VPs.

Several studies have emphasized the need for educating PVUs in terms of vocal care and hygiene.^{2,43} The insufficiency of professional vocal training is the major risk factor in the development of VPs for PVUs. Generally, it is

reported that PVUs do not seek remedy for their VPs even though they are concerned about their vocal health.² The results of the present study also reflected this fact as very few priests (17% of the priests with VP) sought professional help for the VP. Even though few priests (40%) reported that they received instructions for voice care, these instructions were not from voice experts. The instructions included mainly voice rest and home remedies.

The possible reasons for not seeking professional help could be that priests consider VP as a common health-related ailment that goes away with time or a natural occupational hazard, or they may not be aware of the professionals from whom they can seek help for these problems. In India, there is very poor awareness related to occupation-related VPs. Thus, SLPs in India should heighten the awareness among the various PVUs about the VPs that could arise because of their profession and help identify early symptoms of vocal attrition.

Overall, the findings of the present study have shown that Hindu priests as a group of PVUs are at greater risk of developing VPs. This is probably the first study reporting the prevalence of VPs in Hindu priests. Because these priests have very limited opportunities to postpone their rituals or appoint other priests to conduct their professional activities (especially in temples), it is essential to heighten their knowledge regarding factors influencing VPs and how to prevent them. In India, PVUs' knowledge about voice care and its importance is not established compared with Western countries. Hence, SLPs should take great steps in heightening the voice care knowledge of Hindu priests so that it can improve their psychosocial well-being.

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APPENDIX

Prevalence of and risk factors for self-reported voice problems in Hindu priests

Demographic details

Age:

Education:

Part time/full time:

Occupation and training related details

- | | | | |
|----|--|------------|----------|
| 1 | Since how many years you are working as purohit?
<input type="checkbox"/> 0–5 years <input type="checkbox"/> 6–10 years <input type="checkbox"/> 11–15 years <input type="checkbox"/> 16–20 years <input type="checkbox"/> >20 years | | |
| 2 | How many hours a day do you work?
<input type="checkbox"/> <1 hour <input type="checkbox"/> 1–3 hours <input type="checkbox"/> 4–6 hours <input type="checkbox"/> 6–8 hours <input type="checkbox"/> >8 hours
• On an average for how long do you have to chant mantras or shlokas continuously?
<input type="checkbox"/> <1 hour <input type="checkbox"/> 1–3 hours <input type="checkbox"/> 4–6 hours <input type="checkbox"/> 6–8 hours <input type="checkbox"/> >8 hours | | |
| 3 | Have you had formal or informal training for being a purohit?
• If yes, How many months or years you have received training for chanting shloka?
<input type="checkbox"/> <6months <input type="checkbox"/> 6–12 months <input type="checkbox"/> 1–2 years <input type="checkbox"/> 2–4 years <input type="checkbox"/> >4 years | Yes | No |
| 4 | At what age you began practicing chanting shlokas?
<input type="checkbox"/> <10 years <input type="checkbox"/> 11–15 years <input type="checkbox"/> 16–20 years <input type="checkbox"/> 20–25 years <input type="checkbox"/> >25 years | | |
| 6 | Do you have a job in addition to being a purohit?
• If yes, does it involve extensive voice usage?
• If yes, please describe your voice use.
• Do you indulge in singing or mimicry? | Yes
Yes | No
No |
| 7 | Do you work in a noisy environment?
• Do you feel the need to raise your voice against background noise?
• If yes, how noisy do you think is the environment during the puja?
<input type="checkbox"/> Soft (40 dB) <input type="checkbox"/> Moderate (60 dB) <input type="checkbox"/> Loud (70–90 dB) <input type="checkbox"/> Very loud (>100 dB)
• For how many hours per day do you chant in the noisy environment?
<input type="checkbox"/> <1 hour <input type="checkbox"/> 1–3 hours <input type="checkbox"/> 4–6 hours <input type="checkbox"/> 7–8 hours <input type="checkbox"/> >9 hours | Yes
Yes | No
No |
| 8 | Do you do homa/havan (a ritual in which making offerings into a consecrated fire)?
• If yes, how often?
<input type="checkbox"/> once a week <input type="checkbox"/> 3–4 times a week <input type="checkbox"/> 5–6times a week every day
• For how long?
<input type="checkbox"/> <1 hour <input type="checkbox"/> 1–3 hours <input type="checkbox"/> 4–7 hours <input type="checkbox"/> >8 hours | Yes | No |
| 9 | Do you sip water in between puja and homa to overcome the dryness of the throat? | Yes | No |
| 10 | Do you feel suffocated or need to cough inside the garbhagudi (the innermost sanctum of a Hindu temple where resides the idol) while performing the ritual due to the lack of cross ventilation and fumes? | Yes | No |

(Continued)

Voice and Speech Characteristics

- 11 Do you think you need to modify your voice while chanting shlokas and mantras? Yes No
 • What do you do?
 soft or loud talking increase or decrease in the rate of speech varying pitch varying intonation patterns all of the above
- 12 Do you clench your teeth, tense your jaw and tongue, or tighten your neck muscles while chanting or speaking to make your voice or speech more dramatic?
 never rarely sometimes often always

Prevalence of voice problems and awareness

- 13 Have you had any voice-related problems since you started this profession that has prevented you from chanting shlokas, shlokas, and mantras/mæntṛas/or which interfered with your profession? Yes No
 • If you have experienced voice problem, how often was it?
 once in 6 months once in 2–3 months once a month once in 15 days once a week
- 14 When did you first notice your voice problem?
 last 1 week last 1 month last 6 months last 1 year >1 year
- 15 How will you describe the onset of your voice problem?
 sudden gradual intermittent progressive
 • Is your voice problem getting worse day by day? Yes No
- 16 Do you have a problem with your voice today, which is preventing you from doing all you want to do? Yes No
 • If yes, how severe is the problem?
 very mild (<10%) mild (10%–30%) moderate (31%–60%)
 severe (61%–90%) very severe (>90%)
- 17 How would you describe your voice in the last 6 months?
 very bad bad average good very good
- 18 What do you think are the risk factors for developing a voice problem?
 loud chanting or talking continuous talking or chanting background noise smoke (from fire, incense stick, or camphor) all of the above

Please indicate which of the following voice problems you experience often while or after chanting or speaking. Do not include times when the voice problems are associated with illness.

- 19 Hoarseness Yes No
 20 Dryness in the throat Yes No
 21 Voice fatigue Yes No
 22 Tightness in the throat Yes No
 23 Momentary loss of voice or sudden changes in voice or pitch breaks Yes No
 24 Discomfort in the throat Yes No
 25 Pain in the throat Yes No
 26 Reduced breath support or shortness of breath Yes No
 27 Loss of voice Yes No
 28 Trouble with speaking loudly Yes No
 29 Frequent coughing Yes No

Vocal abusive behaviors or phonotraumatic behaviors

- 30 Do you speak with a loud voice? Yes No
 31 Do you consciously alter your voice or speech? Yes No
 32 Do you speak fast? Yes No
 33 Do you usually find yourself doing most of the talking when conversing with a friend or in a social gathering? Yes No
 34 Do you clear your throat often? Yes No
 35 Do you cough frequently? Yes No
 36 Do you chant or speak when you have any throat infections? Yes No
 37 Do you chant or speak when you have any voice problem? Yes No

Lifestyle factors

- 38 Do you have odd timings of food intake? Yes No
 • Does your diet involve the following food items:
 a. Spicy or oily food
 never rarely sometimes often always
 b. Extreme hot or cold items
 never rarely sometimes often always
- 39 Do you fast? Yes No
 • How often do you fast?
 once in 15 days once a week 2 days week 3 days a week 4 days a week

(Continued)

- 40 Do you chew pan or betel?
 never rarely sometimes often always
- 41 Do you experience any problem with your sleep? Yes No
- 42 How many hours in a day you sleep?
 <4 hours 5 hours 6 hours 7 hours 8 hours
- 43 On an average, how many glasses or cups of each of the following do you drink per day?
 • Coffee cups/day
 • Teacups/day
 • Waterglasses/day

Health-related factors

Please indicate if you have any of the following problems that interfere with good health (physical and mental) on a regular basis.

- 44 Asthma Yes No
- 45 Sinus problems Yes No
- 46 Nasal allergies Yes No
- 47 Frequent cold and cough Yes No
- 48 Dry mouth or throat Yes No
- 49 Difficulty in hearing normal conversation Yes No
- 50 Acid reflux or heartburn Yes No
- 51 Stress related to your profession Yes No
- 52 Do you take any medication regularly for any of these problems? Yes No
 • If yes, please indicate for which health problem and what medications.

Impact of voice problem

- 53 How do you feel about your voice problem?
 it does not affect me rarely frustrates me sometimes frustrates me often frustrates me it is a major source of stress and frustration
- 54 In the past 1 year, how much have you missed work because of a problem with your voice?
 none 2–3 days about a week about 2 weeks >2 weeks
- 55 Does the voice problem affect your profession and in turn cause financial burden? Yes No
- 56 Does your voice problem cause you to interact less with your family or friends? Yes No
- 57 Do you avoid going out socially because of the voice problem? Yes No
- 58 Do you have trouble using the telephone? Yes No
- 59 Do you have to repeat myself to be understood? Yes No

Voice care

- 60 Have ever consulted physicians, ear, nose, and throat (ENT) specialists, or speech-language pathologists (SLPs) for your voice problem? Yes No
- 61 How long would you wait to consult if you have a voice problem?
 never few days 7–15 days 1 month >1 month
- 62 Have you received specific instructions about caring for voice? Yes No
 • If yes, from whom did you receive these instructions?
 ENT specialist singing teachers physician speech therapist others; please specify
- 63 What instructions about voice care were given to you? Please specify.
- 64 If you have not received any instructions for voice care, what precautions you take to maintain your voice?
 voice rest vocal hygiene home remedies drinking water any other
- 65 Are you interested in receiving instructions for voice care in future? Yes No
- 66 Do you think adequate voice rest during throat infections can protect you from developing voice problems? Yes No

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