



VOCAL DEMANDS, VOCAL SYMPTOMS AND RISK FACTORS FOR VOICE PROBLEMS IN CALL CENTER OPERATORS

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ABSTRACT

Background: Call center operators (CCOs) are widely recognized at higher risk of developing voice problems and other health related problems. Hence, understanding the vocal symptoms and associated risk factors is essential for developing safety and preventive vocal hygiene measures. Purpose of the study (1) To investigate the vocal demands and voice symptoms experienced by CCOs in India; and (2) to investigate the risk factors associated with reporting of voice problems among these CCOs. Method: This cross sectional study collected data from 1093 CCOs using self-reported questionnaires working at 11 different call centers in and around Bengaluru, Karnataka. Results: CCOs exhibited higher vocal demands by exclusively involving in answering 80-100 calls/shift for an average of 8.7 hours working/shift. Most of the CCOs (59%) exhibited multiple vocal symptoms with dry mouth and throat and constant clearing throat as most prevalent symptoms. Working in other jobs, raising voice due to noise, experiencing stressful calls, hearing difficulty, acid reflux, coaching, throat clearing, water intake and rate of speech were the variables found to have significant influence on CCOs experiencing the vocal symptoms. Conclusion: CCOs experience higher vocal demands and report multiple vocal attrition symptoms. Voice problems in CCOs may appear due to multiple risk factors. Educating the CCOs about vocal hygiene techniques during their training period may help them to protect their voice and improve their productivity. Key words: CCOs, voice problems, risk factors for voice problems



INTRODUCTION

In our present society, the advancement of new speech technology applications in various professional and social contexts has increased the use of voice in professional settings (Vilkman 2000). That is, for these professionals' voice is the primary tool in their profession. The call center operators are one of the example of expanding modern-day speech related professional contexts whose working ability depends exclusively on their voices. There is substantial evidence in the literature that call center operators (CCOs) are at risk of developing occupational voice problems (Jones et al., 2002; Lehto et al., 2003; Taylor & Oates 2004, Devadas & Rajashekhar, 2013). The problem earlier known as 'teachers' syndrome' is now reported often in the young call center employees referred as 'call centeritis' where there is increasing evidence of people losing their jobs due to frequent voice problems.

According to Sataloff (1991) occupational voice users' lifestyle and work, expose them to many dangers that may jeopardize their most valuable instrument of expression. Their voice problems can be labelled as "occupational voice disorders" as the symptoms they suffer from are likely to be caused by exposure at work. The CCOs are exclusively dependent on their voice for their profession (8-10 hours telephone conversation/day) with occasional breaks. Apart from excessive voice use, the work environment factors such as static muscular overload, excessive stress, unsatisfactory air quality, and ergonomic conditions are reported to be the risk factors for the development of voice problems (Gilardi et al., 2008). According to these authors the work environment of call center

demands a good balance between vocal, emotional and cognitive factors. These factors lead to vocal fatigue and eventually vocal fold tissue damage (Titze 1999). This indicates that causes of voice disorders or factors which make the voice more vulnerable to damage are multi-factorial in etiology. Even though professional voice users are susceptible to develop all types of laryngeal pathologies, the functional pathologies are most likely to occur because of improper or excessive use of voice (Stemple, Glaze & Gerdemann, 2000). Voice problems in these professionals adversely affect their career or reduce profit for the employer, creating negative effects on their occupational performance and society (Rantala, Vilkman, & Bloigu, 2002).

The Indian call center industry has its roots in mid-1990s and boomed during 1999-2000. Even though the call centers arrived in India recently, the industry has grown substantially and become integral part of export oriented IT software and services. The Indian call center industry has its roots in mid-1990s and boomed during 1999-2000. Even though the call centers arrived in India recently, the industry has grown substantially and become integral part of export oriented IT software and services. As reported by Taylor and Bain (2005), in India, the call center employee exit and burnout occur in extremes when compared to UK or US call center employees. Certain distinctive characteristics are thought to exacerbate these problems; consistent night shifts, poor building management (temperature, humidity, air conditioning), adopting neutral accent. In literature, different factors are reported to have an effect on voice production in call center employees. The employers in these industries have failed to identify the



importance of voice, which is directly related to the working ability and efficiency of the CCOs. Failure to identify the impact of voice problems on CCOs work performance has resulted in significant occupational voice problems. Voice problems in these professionals adversely affect their career or reduce profit for the employer, creating negative effects on their occupational performance and society (Rantala et al., 2002). Since voice is important work tool for call center employees, understanding the risk factors and their impact is necessary for the assessment and treatment and prevention of voice disorders among these occupational voice users. As the call center positions being lucrative and attractive to the younger population, who are not aware of possible health hazards, could lead to occupation related problems in younger population in Indian call center employees. Hence, the present study was aimed at understanding the vocal demands, vocal symptoms and influencing risk factors for the voice problems in Indian call center operators using self-reported questionnaire.

MATERIALS AND METHODS

Participants

From the official website (www.bangaloreit.in) of the Department of IT and Biotechnology, Government of Karnataka, the investigator extracted information on 64 call centers in Bengaluru from where the participants have been drawn. Out of 64 call centers the researcher contacted HR's of 25 voice-based call centers in Bengaluru, metropolis in southern India. After explaining the purpose of the study and assurance of confidentiality 11 call centers accepted to participate in the study. The employees in

these 11 companies ranged between 250 to 3000.

Description of the questionnaire

This cross sectional survey research was conducted by using modified version of self-reported questionnaire 'voice survey' developed by Jones et al., (2002) to study the prevalence and risk factors for voice problems in telemarketers with the permission of the primary author. The questionnaire was accompanied by a covering letter explaining the broad outline of the research topic with assurance of confidentiality of the participants. The participants were required to sign a consent form included in the questionnaire for documentation and future reference purpose. Even though the original questionnaire included questions related to demographic/vocational/work environment related details, health, lifestyle, personality related factors, impact, concern related to vocal health, career and point prevalence of voice problem, severity of the voice problem etc, the results and discussion of the present study restricted to the objectives of this article.

For the purpose of present study self-reported questionnaire inquired about;

1. Personal data (age, gender, educational level)
2. Vocal symptoms experienced during their career (voice getting tired or weak while talking, needs extra effort to talk, hoarse or rough voice, voice breaks or cracks, throat uncomfortable while talking, need to clear throat, dry throat, scratchy throat, burning sensation in the throat, feeling of tightness or pressure in the throat, chocking sensation, lose voice at the end of



the sentence, lose voice at mid-sentence, lose voice completely)

3. Vocational/work environment related factors: total time worked as CCO, time of work shift (day/night), hours worked/shift, hours worked in other jobs requiring voice use, types of calls handled (inbound/outbound or both), length and number of breaks, type of phone used (handheld, headset), posture at work, comfort of chair and table, background noise and need to raise voice, number of stressful calls/day. The CCOs were asked to indicate their perception related to these factors on a five-point rating scale specific to each question or choosing the one best answer from the choice given.

4. Health related factors: Medical conditions affecting breathing (asthma, allergies, shortness of breath, sinus problems, frequent colds, dry mouth and throat), experiencing acid reflux, smoking, consumption of caffeinated and non-caffeinated beverages, hearing difficulty, medication taken, participation in other activities on regular basis that may stress voice (coaching, singing, yelling/cheering, weightlifting, clearing throat). The CCOs answered these questions by indicating yes/no.

5. Personality related factors: amount of they speak in social situations, rate of speech, loudness of speech. The CCOs rated them on a five-point rating scale.

Data collection

Prior to data collection, the protocol was presented before the institutional ethical committee. On its approval, the study was conducted in accordance with the stipulated guidelines. The researcher handed over the questionnaires HR managers of 11 (7

inbound and 4 outbound) voice-based call centers. The HR managers were requested to distribute the questionnaires to their employees. Questionnaires were distributed in each call center proportionate to number of employees. That is 100 questionnaires were distributed to companies with less than 1000 and 250 questionnaires with more than 1000 employees. The HR managers were requested to collect the filled questionnaires and return to the researcher. Follow up of non-responders by HR managers was restricted by their busy work schedule and inability to contact them individually.

Statistical analysis

Frequency and percentage were used to summarize categorical variables; mean and SD, minimum, maximum were used to summarize continuous variables. Pearson's Chi-square test to compare the differences in prevalence of vocal symptoms, frequency and severity, their effect on job performance, social interaction and vocal problems on the day of survey among males and females. Adjusted odds ratio with corresponding 95% confidence interval with multiple logistic regression using Wald forward selection criteria used to assess the association between vocal attrition symptoms and different influencing risk factors (demographic, vocational, personality, biological). SPSS software version 15 was used for the analysis of all the data. $P < 0.05$ was considered as statistically significant.

Results

Out of 2000 questionnaires distributed across different companies, the researcher obtained 1219 filled questionnaires. After excluding 126 incomplete questionnaires



the responses were analyzed from 1093 eligible questionnaires. Out of 1093 responses 58% (n=632) were from male CCOs and 42% (n=461) were from female CCOs. The demographic, vocational and vocal symptoms were compared between genders and discussed.

Demographic and vocational details of the CCOs

The demographic and vocational details with respect to male and female CCOs are shown in table 1.

Table 1: Demographic and Vocational details of the CCOs. Data are number (percentage) of CCOs unless otherwise specified. Percentages have been calculated based on the number of respondents.

Factor		Male (n = 632)	Female (n=461)	Test statistic	p value
Average age mean+ SD (range)		24.32 SD=3.225 (18 to 38)	24.08 SD=3.159 (18 to 37)	t=1.22	p=0.22
Education	Matriculation	4(1)	0	$\chi^2 = 18.680$	<0.001
	Higher Secondary	184(29)	88(19)		
	Graduation	402(64)	330(72)		
	Post Graduation	42(7)	43(9)		
Vocation					
Period of work as experience CCO	Less than 6 months	154(24)	83(18)	$\chi^2 = 8.605$	0.071
	6 months - 1 year	142(23)	95(21)		



	1 – 2 years	155(25)	129(28)		
	2 – 5 years	168(27)	143(31)		
	5 – 10 years	13(2)	11(2)		
	More than 10 years	0(0)	0(0)		
Average hours worked per shift(range)		8.67(8-10)	8.52(8-10)	t = 3.71	<0.001
Work Shift	Morning	133(21)	109(24)	$\chi^2 = 1.045$	0.307
	Afternoon	154(24)	166(36)	$\chi^2 = 18.477$	<0.001
	Evening	230(36)	199(43)	$\chi^2 = 5.131$	0.024
	Night	476(75)	316(69)	$\chi^2 = 6.122$	0.013
Hours worked/week in other professions	None	387(61)	321(70)	$\chi^2 = 16.190$	0.006
	1-8 hours	122(19)	90(20)		
	9-16 hours	38(6)	15(3)		
	17-24 hours	18(3)	10(2)		
	25-33 hours	16(3)	5(1)		
	More than 33 hours	5(8)	20(4)		
Required use of voice in other profession		78(12)	51(11)	$\chi^2 = 0.419$	0.569
Type of phone used,	Headset	533 (84)	386(84)	$\chi^2 = 3.356$	0.352
	Shoulder held	28(4)	20(4)		
	Handheld	67(11)	55(12)		
	Other	4(1)	0		
Type of calls	Inbound all of the time	255(40)	189(41)	$\chi^2 = 9.003$	0.061



	Inbound most of the times	59(9)	45(10)		
	About half inbound and half outbound	60(9)	63(14)		
	Outbound most of the time	78(12)	37(8)		
	Outbound all of the time	180(28)	127(28)		
Raising voice because of noise	1 Never	114(18)	71(15)	13.55	0.009
	2	93(15)	40(9)		
	3 A few times each shift	348(55)	285(62)		
	4	29(5)	18(4)		
	5 Many times each shift	48(8)	47(10)		
Experiencing stressful calls	1 Never	16(3)	8(2)	4.10	0.393
	2 Rarely	230(36)	156(34)		
	3 Occasionally	248(39)	180(39)		
	4 Often	110(17)	86(19)		
	5 Very Often	28(4)	31(7)		

As shown in table 1 the employees of call centers are young adults (mean age = 24 years for both genders). CCOs were involved exclusively in answering customer calls during the entire working day/shift. The average length of their working day/shift was 8.7 and 8.5 hours (range: 8 to 10 hrs.) for male and female

CCOs respectively, including one 30 minutes and two 10 minutes breaks with handling of 80-100 calls/shift. Around 11% of the female and 12% of the male CCOs involved in other jobs which requires voice use. Almost all the CCOs reported of



experiencing stressful calls either rarely or frequently with no significant difference in terms

of gender. Among them, 21% and 26% of males and females respectively experienced them

very often. Considerable number of CCOs (55% males and 62% females) reported on the need to raise their voices due to the background noise, few times each day with 13% of the males and 14% of the females reporting the need to raise their voices frequently during each shift. As a whole, significantly higher percentage of females reported on the need to raise their voice due to noise as compared to males.

Vocal symptoms

To explore the vocal symptoms experienced by CCOs, they were asked to indicate whether they experienced any of

the 14 vocal attrition symptoms listed in table 2 (vocal and physical discomfort symptoms) since they began working as a call center operator by indicating ‘yes’ or ‘no’. They were instructed not to include symptoms experienced during the time when they were sick, had upper respiratory tract infection etc.

Out of 1093 participants, 446 (41%) comprising of 263 (42%) males and 183 (40%) females did not report of any of these symptoms. The remaining 647 (59% in all comprising of 58% males and 60% females) reported the presence of a single symptom or multiple (two or more) symptoms. Even though the percentage of female CCOs experiencing voice problems was slightly higher (60%) than their male counterparts (58%), it was not statistically significant. ($\chi^2 = 0.406$; $p = 0.524$).

Table 2. The prevalence of individual vocal symptoms reported by the CCOs. Data are percentages (number) of CCOs unless otherwise specified. Percentages were calculated on the number of respondents. P values were derived from the Chi-square test.

	Vocal symptoms	Prevalence		χ^2	p value
		Male (n=632)	Female (n=461)		
1.	My voice seems tired and weak when I talk or sing	17(108)	20(92)	1.467	0.226
2.	It seems to require extra effort to talk	19(119)	17(76)	0.999	0.318
3.	My voice is hoarse and rough	16(99)	10(48)	6.318	0.012
4.	My voice breaks or cracks when I talk	16(101)	13(59)	2.161	0.142
5.	My throat is uncomfortable when I talk	12(74)	11(50)	0.197	0.657



6.	I constantly feel like I need to clear my throat	31(194)	25(117)	3.701	0.054
7.	My throat feels dry	40(251)	45(206)	2.707	0.100
8.	My throat feels scratchy	17(105)	18(84)	0.482	0.488
9.	I have a burning sensation in my throat	8(48)	7(30)	0.476	0.490
10.	I have a feeling of tightness or pressure in my throat	12(76)	12(55)	0.002	0.962
11.	I have a choking sensation in my throat	9(58)	10(46)	0.199	0.656
12.	I tend to lose my voice at the end of a sentence	17(108)	19(86)	0.448	0.503
13.	I tend to lose my voice in mid-sentence	8(51)	9(40)	0.129	0.720
14.	I frequently lose my voice completely	3(20)	3(14)	0.014	0.904

As depicted in Table 2, the prevalence of the following symptoms - “My throat feels dry” and “I constantly feel like I need to clear my throat” was higher when compared to other symptoms in both gender groups. Relationship between experiencing the individual symptom and gender assessed using Pearson’s Chi-square test indicated that the symptom - “my voice is hoarse and rough” was significantly higher in males ($p = 0.012$) than in females. Further, experiencing of other symptoms - “my voice seems tired and weak when I talk or sing”, “my throat feels dry”, and “my throat feels scratchy” was slightly higher in females than male CCOs. Similarly, the symptoms - “I constantly feel like I need to clear my throat”, “my voice breaks or cracks when I talk” and “it seems to require extra effort to talk” were also found to be marginally higher in male CCOs. However, there was no statistically significant difference ($p > 0.05$) between experiencing these symptoms and the gender.

Out of 647 CCOs, 138 (22%) reported of single symptom (70 (20%) males and 64 (23%) females) while 509 (78%) reported of multiple (two or more) symptoms (295

(80%) males and 214 (77%) females). Around 42% of CCOs ($n=269$) experienced these symptoms daily. Majority of the CCOs (74%) reported the severity of their vocal symptoms to be of ‘very mild’ or ‘mild’ and 25% of them reported it to be moderate degree in severity.

Risk factors

To assess the association between reported vocal symptoms and influencing variables, adjusted odds ratio with corresponding 95% confidence interval was estimated using multiple logistic regression variables using Wald forward selection criteria. The variables, which had significant association with vocal symptoms experienced by the call center operators, are discussed below.

Multiple logistic regression analysis did not show any association between demographic variables (age, gender and education level) and experiencing of vocal symptoms. Although none of the demographic variables were found to have significant association with experiencing vocal symptoms, it is quite possible that they indirectly influenced the outcome through their association with those variables showing significant association.



Among the variables (work environment, personality and biological factors), those having significant association with the

reporting of vocal symptoms are shown in Table3.

Table 3. *Factors having significant association with vocal symptoms*

		Unadjusted Odds Ratio (95% CI)	p value	Adjusted Odds Ratio* (95% CI)	p value
WORK ENVIRONMENT/ VOCATIONAL FACTORS					
No. of hours worked in other jobs /week	None	1.00		1.00	
	1 – 8 hours	1.538 (1.118 – 2.116)	0.008	1.681 (1.179 – 2.395)	0.004
	9 – 16 hours	2.297 (1.226 – 4.307)	0.009	2.194 (1.095 – 4.395)	0.027
	17 – 24 hours	1.275 (0.589 – 2.760)	0.538	1.473 (0.617 – 3.515)	0.383
	25 – 32 hours	2.062 (0.791 – 5.376)	0.139	2.225 (0.803 – 6.161)	0.124
	> 33 hours	1.964 (1.155 – 3.339)	0.013	1.602 (0.887 – 2.892)	0.118
Raising of voice because of noise	Never	1.00		1.00	
	Seldom	1.632 (1.042 – 2.557)	0.032	1.336 (0.801 – 2.227)	0.267
	A few times each shift	2.153 (1.544 – 3.003)	<0.001	1.763 (1.217 – 2.554)	0.003
	Often	3.163 (1.587 – 6.304)	<0.001	2.287 (1.043 – 5.015)	0.039
	Many times each shift	4.200 (2.417 – 7.298)	<0.001	2.518 (1.344 – 4.719)	0.004

* adjusted for age, gender and Duration of work



Experiencing stressful call	Never	1.00		1.00	
	Rarely	2.265 (0.947 – 5.417)	0.066	2.404 (0.941 – 6.144)	0.067
	Occasionally	2.891 (1.211 – 6.904)	0.017	2.968 (1.157 – 7.612)	0.024
	Often	4.877 (1.977– 12.031)	0.001	4.322 (1.630 – 11.459)	0.003
	Very often	4.941 (1.784 – 13.685)	0.002	4.298 (1.442 – 12.810)	0.009
PERSONALITY RELATED FACTORS					
Rate of speech in social situations	1 I talk slowly	1.00		1.00	
	2	0.571 (0.339 – 0.960)	0.034	0.686 (0.382 – 1.231)	0.206
	3 I talk at the same speed as others	0.547 (0.371 – 0.807)	0.002	0.515 (0.335 – 0.790)	0.002
	4	0.800 (0.460 – 1.390)	0.429	0.661 (0.352 – 1.239)	0.197
	5 I talk faster than others	0.620 (0.355 – 1.085)	0.094	0.492 (0.262 – 0.923)	0.027
HEALTH RELATED FACTORS					
Problem in hearing normal conversation		4.023 (1.783 – 9.078)	0.001	3.215 (1.313 – 7.873)	0.011
Experiencing acid reflux	Never	1.00		1.00	
	Occasionally	2.439 (1.865-3.189)	<0.001	2.183 (1.631 – 2.922)	<0.001
	Whenever I lie down	2.451 (1.003-5.992)	0.049	3.343 (1.252 – 8.926)	0.016



	After every meal	6.309 (2.171-18.333)	0.001	5.486 (1.766–17.041)	0.003
Regular participation in activities that stress the voice	Coaching	1.667 (1.054 – 2.639)	0.029	1.823 (1.117 – 2.975)	0.016
	Clearing throat	4.174 (2.838 – 6.141)	<0.001	3.754 (2.492 – 5.656)	<0.001
Water intake (less than 7 glasses per day)		0.670 (0.519 – 0.864)	0.002	0.673 (0.507 – 0.893)	0.006

Multiple logistic regression analysis for the work environment/vocational, personality and health related factors as shown in Table 3 revealed significant association with experiencing vocal symptoms. The risk of experiencing vocal symptoms in CCOs who worked in other jobs for more than 33 hours/week was found to be 1.6 times higher than those who did not work in other jobs. The risk was found to be higher even in CCOs who worked in other jobs for lesser than 33 hours/week (Table 3). Similarly, factors such as need to raise the voice due to noise in the work environment and experiencing stressful calls were significantly associated with experiencing vocal symptoms. The risk of experiencing vocal symptoms among the CCOs who reported that they needed to raise their voice many times a shift was 2.5 times higher than those who never raised their voice, and 4.2 times higher in those who experienced stressful calls very often than who did not. Similar results were obtained using unadjusted odds ratio for these two variables as shown in Table 3.

Among the personality factors, rate of speech in social situations was found to have significant association with experiencing vocal symptoms. As noted in Table 3, CCOs who reported to be having a

faster rate of speech had 60% less chance of experiencing vocal symptoms than those who spoke slowly. Similar results were obtained using unadjusted odds ratio (0.620) for this variable.

Among the health related factors, problems in hearing normal conversation, experiencing symptoms of acid reflux, involved in coaching and throat clearing and water intake were found to have statistically significant association with experiencing of vocal symptoms. The adjusted odds ratio for experiencing vocal symptoms with these variables was found to be 3.2 times higher in those reporting hearing difficulty and 5.4 times among those reporting experience of symptoms of acid reflux after every meal. Additional significant biological factors associated with vocal symptoms were regular participation in activities like coaching and clearing of throat which stress the voice. Among the activities that stress the voice, coaching was found to have 1.8 times higher risk while throat clearing, 3.7 times higher risk in experiencing vocal symptoms. Similar results were obtained using unadjusted odds ratio for these two variables (Table 3). In terms of water consumption, it was observed that, CCOs taking less than six glasses of water/day



had 40% lesser chance of experiencing vocal symptoms than those who consumed more than six glasses of water. Similar results were obtained with unadjusted odds ratio, as shown in Table 12.

DISCUSSION

Data for this study was obtained from the CCOs working at different call centers in the city of Bengaluru, the citadel and hub of IT, in South India. Due to non-availability of documented statistics on Indian call centers and the lack of willingness by majority of the centers to participate in the study, purposive sampling was used to obtain the data. Managers of the call centers were personally contacted and appraised of the purpose of the study by the researcher. The results of the present study have been discussed, based on the responses obtained from 11 call centers (7 international and 4 domestic) at Bengaluru. Of the obtained responses, 632 (58%) were from male CCOs and 461 (42%), females.

Vocal demands and vocal symptoms

From the results of the present study we can understand that CCO's by their lifestyle, stress at work environment and the necessity of attending phone calls continuously (average of 8 hours/shift) are engaged in vocally demanding behavior. Tough erratic working hours, assuming false identities, copying foreign accents, changes in social and family life, and work demands responding to telephone calls and simultaneously using display screen equipment increase the risk of developing voice problems (Taylor & Bain, 2005). It has been reported that continuous use of voice for two hours is the maximum allowable time and exceeding that would cause a person's vocal mechanism to be strained and tensed (Lehto et al., 2003). The

current study found call center operators working for an average of eight hours per shift with occasional (2 times) 5-10 minutes break in between and an half an hour lunch/dinner break. This further reflects on the strain that their vocal mechanism is subjected to and leading to vocal symptoms. As reported by Titze (1999), in these professionals, the accumulated injury during the work shifts can reach a point where day to day recovery is not possible. This study endorses that these could be the possible reasons for the higher prevalence of vocal symptoms in call center operators. Apart from this majority of the CCOs in the present study were between the age group of (20 to 30 years), vulnerable for strain as reported by Tavares and Martins (2007) that younger employees lack preparation to deal with the vocal demands.

The prevalence of vocal symptoms in the present study was analyzed by asking the participants to report the presence of voice problems from the 14 vocal symptoms listed in the questionnaire. Of the 1093 call center operators who participated in the study, 647 (59%) had either single or multiple symptoms, a finding consistent with the reports of CCOs at risk for developing voice problems (Titze et al., 1997; Grayson, 2001; Jones et al., 2002; Taylor & Oates, 2004; Matic, 2006). The consistently higher prevalence of voice problems in CCOs from different studies suggests that vocal problems are universal, owing to the vocally abusive behavior associated with this occupation. The present study did not find any significant difference between genders in reporting of vocal symptoms. This finding is in consonance with studies in the literature (Lehto et al., 2003; Taylor & Oates, 2004; Oliveira et al. 2009) reporting of non-significant differences in experiencing of



vocal attrition symptoms between genders. This could find an explanation to the similar nature of work for both genders in call centers. Dryness of the throat and the need to clear the throat were the most prevalent symptoms reported by the CCOs (both genders) which could be attributed to relatively low ambient humidity and high temperature (23° C) in call center offices (Jones et al., 2002; Lehto et al., 2003; Lehto et al. 2005). This aspect has not been measured and documented in the current study and hence is not addressed in the discussion. It is generally accepted that, when a person experiences dry throat, there is an associated feeling of something lodged in the throat necessitating frequent throat clearing. Further analysis of the parameter of self-perceived hoarseness revealed it to be more in males which was statistically significant ($p = 0.012$). This is similar to the reports in the literature of self-reporting of hoarseness as the major symptom associated with vocal fatigue. However, the higher percentage of male CCOs reporting of hoarseness in this study could be attributed to the association between their low pitch and perception of hoarseness (Munoz et al. 2003). Apart from these frequently reported vocal symptoms CCOs reported several other symptoms as shown in table 2, which indicates CCOs in general experience vocal fatigue. The presence of vocal fatigue among the CCOs in the present study could possibly be related to the heavy vocal loading of 8-9 hours of their telephone conversation, with the customers under heavy work pressure. Each CCO in the present study was expected to handle around 80 -100 calls/day of overseas customers (personal communication) warranting excessive use of their voice to meet their job demands. In addition, it could also be interpreted as an outcome of functional voice disturbances

and in reverse, as a consequence of voice load or inappropriate vocal behavior (Sapir et al., 1990).

It was further observed in the present study that majority ($n = 509$) of the CCOs reported multiple (two or more) symptoms. Among them, 92% (92% males and 93% females) experienced them frequently (once in two months or more frequently); 40% had these symptoms daily with a greater number identifying them as of milder degree and only 4%, as of severe degree. This clearly suggests that CCOs are prone to experience more frequent voice problems, though not with great severity. Similar findings have been reported in the literature (Lehto et al. 2003; Lehto et al. 2005). It can thus be stated that, CCOs are at greater risk of developing voice disorders, as substantiated in the current study and literature (Gilardi et al., 2008). As the greater frequency of occurrence of vocal symptoms is considered as the early signs of vocal attrition (Casper & Murry 2000), the current study projects the need to educate CCOs on early identification and management.

Risk factors

As shown in table 3 CCOs working in other profession requiring voice use, raising voice due to noise, experiencing stressful calls, hearing loss, acid reflux, and participating in vocally stressful activities were found to be significant risk factors associated with CCOs reporting voice problems. Working overtime increases vocal loading (Loomis 2005) and was found to be one of the significant risk factor for the voice problems in CCOs in the present study. As this factor is found to have a significant association with development of vocal symptoms, educating CCOs on avoiding extended work beyond



their regular routine and when unavoidable, being cautious about use of voice during extended work time is justified and emphasized.

Raising voice to communicate effectively in the presence of background noise leads overuse or misuse of the vocal mechanism and contribute the development of voice problems (Vilkman 2000). High levels of background noise increase the speaker's vocal intensity and fundamental frequency, which in turn increase vocal fold approximation and its pressure of adduction and the risk of vocal fold dysfunction (Lane & Tranel 1971; van Heusden, Plomp & Pols 1979). To communicate effectively in the presence of high background noise, the CCOs raise the volumes in their headsets and speak louder, which further increases the ambient noise levels (Jasmine, 2004). The findings of the present study lend support to the reports in the literature (Jones et al. 2002; Taylor & Oates 2004), that the raising of voice due to noise was significantly associated with work being affected in telemarketers.

Generally, stress is more inherited in call center professionals than others (Titze 1994). This finding is more applicable to the Indian setup and is reflected in the present study with 62% CCOs reporting stressful calls either occasionally or frequently. Indian call center operators experience a lot of stress by way of telephone interaction which demands co-ordination of optimum psychological, behavioral and environmental settings to maintain an efficient balance. Even though Indian call centers recruit employees with a minimum of 15 years education with good English knowledge, they are not sufficiently empowered to handle more than a routine call satisfactorily. Those

CCOs who experienced stressful calls very often were 4 times likely to report of vocal symptoms than those who did not. Similar findings have been reported by Jones et al., (2002); Taylor and Oates (2004) and Lin et al. (2010) who found significant association between experiencing stressful calls and work being affected. Increased psychological stress has been stated to increase musculoskeletal tension leading to vocal dysfunction as pain and discomfort of laryngeal muscles, hoarseness, reduction of pitch range, and tight laryngeal and pharyngeal constriction (Johnson 1993; Lierde et al., 2009). There is hence an universal consensus that call center work is stressful and the understanding of the relationship between stress and voice production becomes relevant in CCOs.

Experiencing of acid reflux after every meal has shown 5.4 times greater risk of developing vocal symptoms compared to those who did not report any symptoms of acid reflux. This is in consonance with the studies in the literature (Koufman, Sataloff & Toohill 1996; Pribuisiene et al. 2006; Sataloff 2008; Lowden et al. 2009).) stating LPR is one of the most common causes involved with voice problems. Studies endorsing the association between LPR and dysphonia have attributed it to the inflammatory process (Reinke's edema) and frequent throat clearing associated with LPR, which in turn alters the mucosa of the vocal folds. This could be the possible reason for the significant association between experiencing symptoms of LPR and vocal symptoms reported by the CCOs.

Reports in the literature suggests that, speakers who have hearing difficulty have less control over their voices, and use higher pitch and increased vocal fold adduction, resulting in vocal loading and



symptoms of vocal fatigue (Lane & Tranel 1971; Benninger 1993; Gotaas & Staar, 1993). This was found to be true in the present study as 39 (85%) out of 46 CCOs with hearing difficulty experienced vocal symptoms. This indicates the role of impaired hearing in the development of vocal symptoms and warrants the need to educate the employers and CCOs regarding the relationship between this factor and development of vocal symptoms and to consider appropriate preventive measures.

Reports in the literature suggest that rapid rate of speech contributes to laryngeal pathology due to faulty use of laryngeal mechanism during rapid rate of speech and attributed to insufficient breath support (Stemple et al. 2000). However, the findings of the present study did not support this finding as higher number of (70%) CCOs who reported experiencing voice problems spoke slowly in social situations. Hence, it can be presumed that, in social situations, higher number of CCOs spoke slowly, softly or stayed quiet because of their voice problems. It is hence reasonable to assume that amount of vocal demands as dictated by the CCO's lifestyle and occupation could strongly influence their speaking in social situations. Similarly, the present study considered consuming more than seven glasses (11/2 liters) of water/day should protect the CCOs from developing the vocal symptoms. Multiple logistic regression analysis revealed 65% of the CCOs with voice problems consuming more than seven glass of water/day. This finding can be interpreted as; CCOs experiencing vocal symptoms consume higher quantity of water more frequently to keep their throat hydrated and to get relief from the associated laryngeal sensations.

The results of the present study indicate that besides the vocal demands experienced by CCOs, there are other factors such as vocational, personality and biological conditions that serve as contributing factors. These findings confirm that the causes for the development of voice symptoms are multifactorial and cannot be explained only by the amount of vocal demands involved in a particular profession. This finds a reference in the literature too (Jones et al. 2002; Lehto et al. 2003, Lehto et al. 2005). This finding emphasizes the need to analyze the handicap, activity limitation and restriction in participation, in order to truly understand the effect of voice problems in this population.

The higher prevalence of vocal symptoms as reported by CCOs, emphasizes on the dire need to analyze the handicap, activity limitation and restriction in participation, in order to truly understand the effect of voice problems in this population. Having established the fact that CCOs are at greater risk of self-reporting vocal symptoms, and the impact of the vocal symptoms on their performance, it is apparent that the CCOs need to be educated in preventive vocal measures. The educative program should address the practical strategies for maintaining a healthy voice, preventing vocal strain and enhancing professional performance. In particular, information needs to be provided on the detrimental effects of voice misuse activities on the vocal apparatus. With working environment being unique, individual work place evaluation of call centers will enable appropriate preventive vocal measures to reduce the occurrence of voice problems (i.e., improving the working environment; such as comfort, seating arrangements, reducing the noise etc). These



modifications, if implemented and incorporated should certainly help the CCOs to have a long standing and sustained healthy voice and be more productive to their employers.

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