MJMR, Vol. 34, No. 2, 2023, pages (88-92)

Open Access
ISSN:2682-4558

Research Article

The perceptual Evaluation of Voice in Morbid Obesity

Zienab Khalaf Mahmoud[1]; Wafaa Helmy Abd El Hakeem[1]; Mohamed Khalaf Allah Kamel[2]; Doaa Mohammed Ali[1]; Al shimaa Abd El monem Dakhely[1]; Marowa abdelwahab[1]

[1] Phoniatrics unit, ENT Department, Faculty of Medicine, Minia University, Minia, Egypt
[2] General surgery Department, Faculty of Medicine, Minia University, Minia, Egypt

DOI: 10.21608/mjmr.2023.185113.1275

Abstract

Background: The human voice is a complex phenomenon. Anatomofunctional features, psychological traits, and social and professional aspects all influence human vocal quality. Voice disorders, also known as dysphonia, affect 3%–9% of the population. Obesity is a worldwide epidemic. All systems in the body are affected, either directly or indirectly, to various degrees. Due to the physical-pathological modifications related to obesity that compromise virtually all of the body's systems, evaluation of the vocal behavior of obese patients has become a subject of interest. One of these alterations is the corporal disposition of excessive fat, with abnormal fat deposits observed on the uvula, soft palate, lateral and posterior walls of the pharyngeal walls, and posterior region of the tongue, all of which are structures belonging to the vocal tract. **Aim of the study:** to cast more light on the effect of obesity on voice in patients with morbid obesity. **Methods**: this study consisted of a random sample of 50 morbid obese patients. Each patient was subjected to the following survey study, including this data: patient interview and history taking, Auditory Perceptual Assessment (APA), general examination (BMI and NC). **Results:** A total of 50 obese women were included, with an average age of 36.8 years, a weight of 132.6–20.5 kg, BMI of 52.3–9.4 kg/m2, and neck circumference of 40.51.9. Gastro esophageal reflux symptoms (53.3%) prevailed. **Conclusions:** Obesity lead to an important and gradual increase in anthropometric parameters. The voice becomes hoarser, lower in pitch, and less stable, and the patient needs to use more effort to overcome the increase in respiratory resistance.

Keywords: obesity, respiration, phonation, BMI, NC.

Introduction

In humans and other animals, the voice is the primary means of communication. Voice transmits a variety of information, including physical characteristics such as body size and sex, as well as cues to the vocalizing individual's identity and emotional state. Dynamic changes in the physiological vocal production system produce vocalizations.

The respiratory system, laryngeal system, articulation, and nervous system are the four cardinal body systems involved in the production of speech in humans. The first three systems control the physical aspects of speech, while the nervous system regulates these systems on both the conscious and subconscious levels.**[1]** .

The voice is produced in three steps: The primary sound produced by vocal fold vibration is referred to as "voiced sound". This is also known as a "buzzy" sound. The voiced

sound is then amplified and modified by the vocal tract resonators (throat, mouth cavity, and nasal passages); this process is known as resonance. The resonators produce the person's distinct voice. At last, the vocal tract articulators (the tongue, soft palate, and lips) alter the voiced sound; this process is known as articulation. Words are produced by the articulators.**[2]**.

Phonation must be coordinated with respiration. Phonation is a dynamic system. Low subglottal pressure is required for vocal fold vibration. This minimal subglottal pressure is known as the phonation threshold pressure (PTP)**[3].**

PTP can be affected by the configuration of the glottal aperture and the viscoelasticity of the vocal folds. The tension and elasticity of the vocal folds can be adjusted because they are shelf-like elastic protuberances of muscles and mucosa. They can be thinner, thicker, shorter or longer, open wide, close together, or come together in the central portion. They can also be raised or depressed in their vertical relationship to the cavities above. **[4]**.

Obesity is a major public health issue because it significantly increases the risk of diseases such as type 2 diabetes, fatty liver disease, hypertension, myocardial infarction, stroke, dementia, osteoarthritis, obstructive sleep apnea, and several cancers, contributing to a decline in both quality of life and life expectancy. Obesity is also linked to unemployment, social disadvantages, and lower socioeconomic productivity, posing an increasing economic burden **[5]**.

Obesity can cause changes in the three levels of voice production: the respiratory system (due to adipose tissue deposition in the thoracic and abdominal regions), the vibratory system (due to increased vocal fold mass), and the resonator system (due to the deposition of fat on the circumference of the neck, altering the dimensions of the pharyngeal resonator channel)**[6]**.

Aim of the study: to cast more light on the effect of obesity on voice in patients with morbid obesity.

Patients and methods:

The present study occurred at Minia University Hospital and a general surgery private clinic for the duration of the period between January 2022 and September 2022 and included 50 subjects were diagnosed as morbidly obese (BMI > 40), their age between 20 and 55 years old. Patients were assessed according to the voice assessment protocol in the Phoniatrics Unit, Minia University Hospital, as follows:

I- Elementary Diagnostic Procedures:

1- Subject interview and history taking including personal history (name, age, sex, residence, marital status, number of children and their ages, education, occupation), complaint, and clinical symptoms of the patient, such as change of voice, throat pain, throat dryness, globus sensation, frequent throat clearing, and chocking attacks.

Symptoms of reflux include a burning sensation in your chest (heartburn), regurgitation of food or sour liquid, upper abdominal or chest pain, trouble swallowing (dysphagia), and the sensation of a lump in your throat.

2- Auditory perceptual assessment "APA": each voice sample was recorded for approximately 5 seconds while sustaining the vowel [a:] three times and reading the "walk paragraph" at a comfortable pitch and loudness. Acoustic analysis was performed on the stable central 3 seconds of a sustained vowel and the "walk paragraph". In this study, we used the "grade" factor in the GRBAS scale to rate overall severity.

II) Clinical Diagnostic Aids:

a- BMI > 40 [BMI= weight in kg \ (height in meters)^2].

b- Neck circumference (in cm) was measured in the midway of the neck, between the mid-cervical spine and mid-anterior neck, to within 1 mm, using non-stretchable plastic tape with the subjects standing upright. In men with a laryngeal prominence (Adam's apple), it was measured just below the prominence. While taking this reading, the subject was asked to look straight ahead, shoulders down but not hunched. Care was taken not to involve

the shoulder or neck muscles (trapezius) in the measurement.

Ethical consideration:

This study was approved by the Ethics Committee for Research in the Faculty of Medicine, Minia University (Approval No. 209:2022), and consents were obtained from subjects.

Statistical analysis:

Data entry and analysis were all done on an I.B.M.-compatible computer using software called SPSS (Statistical Package for Social Science) for Windows version 13. Graphics were done in Excel.

Quantitative data were presented by mean and standard deviation, while qualitative data were presented by frequency distribution.

For each subject, the parameters were collected before and after surgery, and the appropriate statistical analysis for small samples (Wilcoxon nonparametric paired test) was conducted. The analysis took into consideration the design (before and after) and modality of data collection (paired data).

P value was considered statistically significant (S) if < 0.05, highly significant (HS) if < 0.001, and not significant (NS) if >0.05. A post-hoc test was used to differentiate between P values.

Results

The mean age of the studied sample was 36.8±9.6, 18 (36% of patients) were males, and 32 (64% of patients) were females.

Twenty-seven (53.3%) of patients had reflux, while 23 (46.7%) of patients didn't have reflux. Thirty-three (67.7%) of patients in G had phonasthenia, while 17 (32.3%) of patients didn't have phonasthenia.

There was no change in the grade, loudness, or glottal attack of the voice of our study group, but their pitch was lowered (characterized by a low-pitched voice). The mean BMI of G was 52.3±9.4 The mean neck circumference for G was 40.5±1.9

Table 1: Distribution of individuals (N = 50) according to sociodemographic data:

Sociodemographic characteristics		**G**
Age	**Mean ±SD**	**36.8±9.6**
Sex	**Male** **Female**	**18(36%)** **32(64%)**

; SCV: sensory conduction velocity

Table 2: Distribution of individuals in the group study according to reflux

Reflux (N - %)	**G**
Absent	**23(46.7%)**
Present	**27(53.3%)**

Table 3: Distribution of individuals in S1, S2, and S3 according to phonasthenia

Phonasthenia	G
No	17(32.3%)
Yes	33(67.7%)

Table 4: Distribution of individuals in group studies according to APA:

APA	Normal	Abnormal
Grade	50(100%)	0(0%)
Pitch	20(40%)	30(60%)
Loudness	50(100%)	0(0%)
Glottal attack	50(100%)	0(0%)

APA= auditory perception assessment

Table 5: Distribution of individuals in the group study according to BMI and neck circumference

Variable		G
BMI (kg/ m^2)	Mean ±SD	52.3±9.4
Neck circumference:	Mean ±SD	40.5±1.9

Discussion

Normal voice characteristics include adequate loudness for the environment, pitch appropriate for age and gender, pleasant quality, free of random noise, flexibility with variations in emphasis, and significance. Dysphonia is a symptom defined as "difficulty emitting voice with its natural characteristics"**[7]**.

Obesity is a health issue that affects many body systems, including respiration and voice. The air exhaled from the lungs is modulated in the vocal fold and is modified in resonating cavities such as the pharynx, oral, and nasal cavities, as well as by structures such as the lips, tongue, and palate **[7]**.

Obesity and voice are linked because of the influence of excess body weight on abdominal breath support for voice production. Obesity can impair resonance in severe cases due to a significantly reduced pharyngeal lumen **[8]**.

We observed that the study group had phonasthenic symptoms. In the study group, 33 (67.7%) of morbidly obese patients had phonasthenia, and 17 (32.3%) of morbidly obese patients didn't have phonasthenia. This may be explained by the restriction of diaphragm movement by fat deposition, which leads to decreased respiratory volume and impaired phonation with a decrease in MPT. All of these previous factors made patients put in more effort to produce sustained phonation and expressed this in the form of vocal fatigue. So after weight loss, all these factors decreased and led to an improvement in phonasthenia. And this result agree with ***[9]*** who reported that 21 women with morbid obesity were aged between 28 and 68 years, with an average age of 41.33 (±11.26) years. Of these, 14 (66.6%) suffered from vocal complaints

before the operation. Among the volunteers that reported vocal complaints, 10 described having vocal fatigue (71%), eight described voice failure (57.14%), seven described vocal effort (50%), and six described drying of the vocal tract (42.8%). After surgery, none of the women reported vocal complaints.

We also observed that the group studied had a high neck circumference (NC). In G, the mean neck circumference (NC) was 40.5±1.9. Neck circumference is indicated as a predictor for body weight; excess fat in the upper region of the body causes an increase in neck circumference.

This agree ***de [10]*** who reported that measurement of NC can be used to define obesity and that excess fat and muscle can overwhelm the respiratory system.

We observed that patients in the group study had reflux symptoms. In G, 53.3% of patients had reflux symptoms. This result may be explained by the fact that in overweight and obese patients, extrinsic gastric compression from increased visceral adiposity may result in increased intragastric pressure and thus a favorable pressure gradient for reflux to occur. And this result agrees with **[11]**.

Conclusion:

Obesity leads to an important and gradual increase in anthropometric parameters. The voice becomes hoarser, with a lower pitch and less stability, and the patient needs to use more effort to overcome the increase in respiratory resistance.

References

1. Alkhafaji, M.R. and D. Emam, Physiology of the Voice and Clinical Voice Assessment, in Textbook of Clinical Otolaryngology, Springer 2021:15(3) p. 515-520.

2.Chen, J.C., Elements of human voice. World Scientific 2016:45(4)p.123-126.

3. Scherer, R.C., Laryngeal function during phonation. Professional voice: the science and art of clinical care, 2017: p. 281-308.

4. Duflo, S. and S.L. Thibeault, Anatomy of the larynx and physiology of phonation. Textbook of laryngology, 2007:57(6)p.176-179.

5. Blüher, M., Obesity: global epidemiology and pathogenesis. Nature Reviews Endocrinology, 2019. 15(5): p. 288-298.

6. Bosso, J.R., et al., Vocal characteristics of patients with morbid obesity. Journal of Voice, 2021. 35(2): p. 329. e7-329. e11.

7. Abdel Hamid, A., H. Soliman, and R. Abdelhalim, A study of voice quality in obese Egyptian children. The Egyptian Journal of Otolaryngology, 2021. 37(1): p. 1-7.

8. Engin, A., The definition and prevalence of obesity and metabolic syndrome. Obesity and lipotoxicity, 2017:29(7) p. 1-17.

9. SOUZA, L.B.R.d., et al., Vocal complaint, auditory-perceptual assessment of voice and vocal self-assessment in women with morbid obesity. ABCD. Arquivos Brasileiros de Cirurgia Digestiva (São Paulo), 2015. 28: p. 23-25.

10. de Souza, L.B.R., et al., Neck circumference and vocal parameters in women before and after bariatric surgery. Obesity Surgery, 2016. 26(3): p. 576-580.

11. Khan, A., et al., Impact of obesity treatment on gastroesophageal reflux disease. World Journal Of Gastroenterology, 2016. 22(4): p. 1627.