Original Research Article

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Effect of face mask use on hearing impaired adult patients

Tanvir Hussain^{1*}, Anish Patil², Khalid Munir¹, Marcus Choo¹

¹Department of Otolaryngology/Head and Neck Surgery, Sligo University Hospital, Sligo, Ireland ²SpR Anesthesia Department Queens Hospital Burton, UK

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*Correspondence: Dr. Tanvir Hussain,

E-mail: tanvir_hussain14@yahoo.com

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ABSTRACT

Background: In many countries, the increased use of face masks and other face coverings has been adopted as a response to the COVID-19 pandemic. The world health organization has given guidance that encourages the use of face masks in public settings as well as in settings where it is not possible to observe physical distancing.

Methods: This research project was carried out from August 2021 to November 2021 in the ENT Department of Sligo University Hospital. The 100 patients with hearing impairment were randomly sampled from patients seeking health care services in the ENT clinic. Patients with normal hearing were excluded from the study. Data was collected with the help of questionnaire. The collected data was pre-coded for entry in SPSS and analyzed.

Results: The respondents comprised 55 females and 45 males. Majority (80%) of the respondents generally agreed that the use of face masks has a negative impact on communication and hearing, especially for patients with hearing impairment. 60% of respondents agree that the use of clear masks may provide the option to lip-read. 80% of respondents agree that the use of face masks has a negative impact on communication and 50% of respondents agree that poor communication is likely to result in patient dissatisfaction.

Conclusions: It was evident that most hearing-impaired patients are aware of the importance of facial expression in communication and most rely heavily on lip reading in addition to other facial features.

Keywords: Adult patients effect, Face mask, Hearing, Impaired, Usage

INTRODUCTION

In many countries, the increased use of face masks and other face coverings has been adopted as a response to the COVID-19 pandemic. The world health organization has released guidance that encourages the use of face masks in public settings as well as in settings where it is not possible to observe physical distancing. According to Asadi et al the use of face masks has been instrumental in reducing particle spread, thereby reducing viral transmission from one person to another. However, it has not yet been established, or well understood, the impact of face masks on communication and hearing, especially for patients with hearing impairment. A better understanding of the impact of face masks on

communication and hearing will enable the improvement of face mask design, communication awareness (especially when dealing with hearing-impaired patients), and the provision of more informed advice to health care service providers and the general public. Having the lower part of the face covered can impact communication in a number of ways. Facial visibility is limited, thus removing visible cues that might be used for reading the lips and mouth. Facial expression is suppressed and wearing a mask can affect sound transmission, muffling the user's voice.

It is estimated that almost 35% of all adults aged above 65 years require treatment that is related to some form of hearing loss, with a significant proportion of them

requiring acute care admissions.³ Various reports have indicated that both visual and auditory stimulation help in appreciating and understanding vocal stimuli.⁴ The mandatory use of face masks in acute care settings during the COVID-19 pandemic has had a potentially negative effect on history taking and educating or counselling patients. Although this shift has been necessary, it has made communication with patients, particularly the hearing impaired, and their relatives, more problematic.

A significant number of the hearing impaired, from mild to severe, rely heavily on lip reading in addition to other facial expressions. ^{5,6} Following the mandatory use of face masks, these patients have been finding it far more difficult to lip read or recognize facial cues. ^{7,8} This is more pronounced in situations where a hearing impaired patient is required to communicate concerns, to respond to health care questions, or to understand their management or diagnosis, especially during encounters in a high volume facility where rapid service delivery is commonplace. Compounding the problem, a significant number of these patients do not wear identifiable hearing disability signs or "hearing-impaired" badges, which might alert health care workers and others to their communication difficulties. ⁹

According to the world health organization masks are key in reducing the spread of COVID-19, although there are some negative aspects to health care delivery, especially for patients with hearing impairment.9 Newton and Shah reported that masks tend to muffle portions of highfrequency sound that are important to speech. 10 In addition, masks have made communication increasingly challenging in areas commonly known for loud background noise, including acute care wards and emergency departments. Lack of consideration or recognition of hearing impairment is among the leading barriers in health care service delivery to patients with hearing impairment.¹¹ Health care service providers who fail to address the needs of hearing-impaired patients breach professional and ethical duties, especially during a pandemic, and may face malpractice suits. 12 Also, deaf patients who could have relied upon members of their family or friends in translating consultations for them are increasingly being advised to access health care services by themselves without companion support. Another barrier to access quality health care services is the admission of hearing-impaired patients to wards in which the nursing and medical staff wear masks. This makes awareness and recognition of this potentially "invisible" disability important for health care service providers. According to Crume et al it is highly likely for poor communication to result in poor health care outcomes, including patient dissatisfaction, unnecessary investigation, and discontinuity of care, among others.¹³ In order to address this, clinicians must be mindful of patients with hearing impairment. For a health care service provider to recognize that a patient is hearing impaired, the provider has to observe the body language of the patient, read the patient's general practitioner notes prior to interacting with the patient, or ask the patient directly. Although half the visible face may be covered when one wears masks, it is still important for a health care provider to face patients when communicating to enable the interpretation of facial expressions through other facial muscles and the eyes.

Study objective

The objective of the study was to investigate the effect of face mask use on hearing impaired adult patients.

METHODS

Study design

The study design was of cross-sectional study

Participants and procedure

The study was performed from August 2021 to October 2021 in the ENT Department of Sligo University Hospital. The 100 patients with reduced hearing were randomly sampled from those attending the ENT clinic. The respondents comprised 55 females and 45 males. Any patient with normal hearing was excluded from the study.

Ethical requirements

The respondents who participated in the survey gave their oral consent before the study was conducted. The ethical requirements for the collection of personal data were strictly followed.

Questionnaire design

Respondents were asked to indicate their agreement level for each item on a seven-point Likert-type scale, from 'strongly disagree (=1)' to 'strongly agree (=7)'. Options included; strongly disagree (=1), disagree (=2), somewhat disagree (=3), either agree or disagree (=4), somewhat agree (=5), agree (=6), and strongly agree (=7). Mean near close to (7) is strong agreement and mean near close to (1) is strong disagreement.

Data cleaning and analysis

The collected data was pre-coded for entry in SPSS, the statistical software package. Data entry error was minimized by the incorporation of a check code in addition to cleaning the data by frequency run and reverse coding to ensure consistency.

RESULTS

The results of the analysis are summarized below. Figure 1 demonstrates the respondents' level of agreement on whether the use of face masks has a negative impact on communication and hearing, especially for patients with hearing impairment. It was evident that 35% of the

respondents strongly agreed, 23% of them agreed, 22% of them somewhat agreed, 10% were neutral (neither agreed nor disagreed), 5% somewhat disagreed, 3% disagreed, and only 2% strongly disagreed. Therefore, the majority (80%) of the respondents generally agreed that the use of face masks has a negative impact on communication and hearing, especially for patients with hearing impairment.

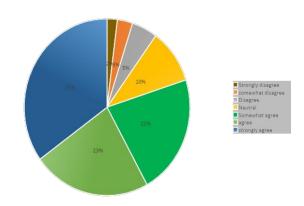


Figure 1: Negative impact of using face mask on communication and hearing, especially for patients with hearing impairment.

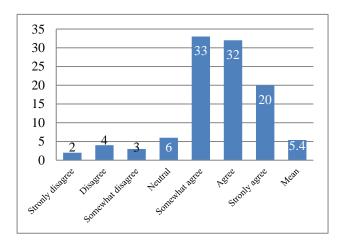


Figure 2: Need to be aware of facial expression of a person to aid communication.

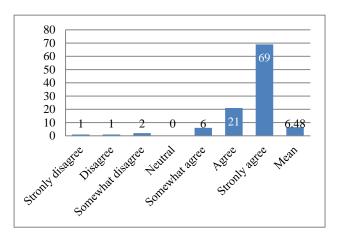


Figure 3: Importance of lip reading in addition to other facial expressions.

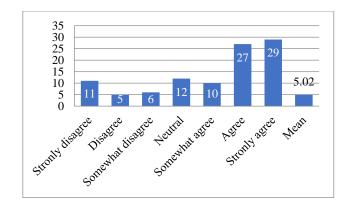


Figure 4: Lack of consideration or recognition of hearing impairment is among the leading barriers in health care service delivery.

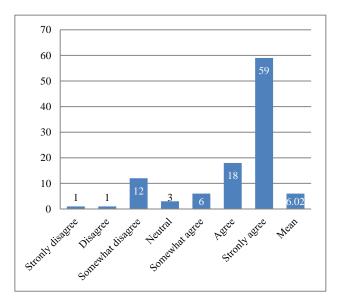


Figure 5: Poor communication likely to result in poor health care outcomes.

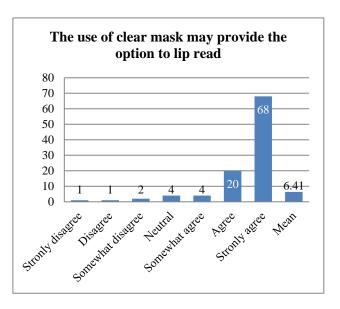


Figure 6: Use of clear masks may provide the option to lip-read.

Table 1: Mean score of each statement.

Statement/questions	Mean
I am aware of the need to see the facial	Ivicuit
expression of a person to aid	5.40
communication	
The use of face masks is important in	7 .00
reducing the spread of COVID-19	5.88
The use of face masks has a negative	
impact on communication and hearing,	5.50
especially for patients with hearing	5.56
impairment	
Covering the lower part of the face using	6.57
a face mask limits visibility of the face	0.57
Covering the lower part of the face using	
a face mask removes visible cues that are	6.13
used for speech reading the lips and	0.13
mouth	
Covering the lower part of the face using	5.62
a face mask changes sound transmission	3.02
Both visual and audible stimulation help	
in appreciating and understanding vocal	5.4
stimuli	
I rely heavily on lip readings in addition	6.48
to other facial expressions	0.10
I find it far more difficult to lip read or	
recognize facial cues following the	6.41
mandatory use of face masks	
Patients with hearing impairment need to	
wear identifiable hearing disability signs	4.42
or "hearing-impaired" badges	
Masks tend to muffle portions of high-	5.00
frequency sound that are important to speech	5.02
Lack of consideration or recognition of	
hearing impairment is among the leading	5.02
barriers in health care service delivery	3.02
Hearing-impaired patients should be	
accompanied by their family members or	
friends to translate consultations for them	4.35
when seeking health care services	
Poor communication is likely to result in	
poor health care outcomes	6.02
Poor communication is likely to result in	
patient dissatisfaction	5.61
Poor communication is likely to result	7 0 7
unnecessary investigation	5.05
Poor communication is likely to result in	5.00
discontinuity of care	5.39
Clinicians need to be mindful of patients	6.47
with hearing impairment	6.47
The use of clear masks may provide the	C 41
option to lip-read	6.41

69% of respondents strongly agree that face masks limit facial visibility and, not surprisingly, 69% of respondents agree they find it far more difficult to lip read or recognize facial cues following their mandatory use. 68% of respondents agree that covering the lower part of the

face using a face mask changes sound transmission. 60% of respondents agree that the use of clear masks may provide the option to lip-read. 80% of respondents agree that the use of face masks has a negative impact on communication and 50% of respondents agree that poor communication is likely to result in patient dissatisfaction. 53% of respondents somewhat agree that poor communication is likely to result in unnecessary investigation. Understandably therefore, 68% of respondents agree that poor communication is likely to result in poor health care outcomes.

Despite the majority of respondents being aware of the negative impact of face mask use on communication and health outcomes and strong support for the notion that clinicians be mindful of patients with hearing impairment (mean 6.47), there was less support for the use of badges or signs to indicate that the wearer has a hearing impairment. This suggests that a perceived stigma may surround the advertisement of one's hearing disability. Similarly, there was little support for the statement, 'hearing-impaired patients should be accompanied by their family members or friends to translate consultations for them when seeking health care services' (mean 4.35), inferring that hearing impaired patients might prefer an independent, unbiased assistant (or technological solution) to aid communication in much the same way as a translator would be used for non-English speaking patients.

DISCUSSION

According to results of this study 69% of respondents strongly agree that face masks limit facial visibility and, not surprisingly, 69% of respondents agree they find it far more difficult to lip read or recognize facial cues following their mandatory use. Which is supported by previous study participants with severe-to-profound hearing loss benefited from the presence of visual cues as evidenced by better performance in audiovisual conditions than any other condition, more over study findings confirm improved speech perception performance in noise for listeners with hearing impairment when visual input is provided using a transparent surgical mask. Most importantly, the use of the transparent mask did not negatively affect speech perception performance in noise.¹⁴

68% of respondents agree that covering the lower part of the face using a face mask changes sound transmission. The 60% of respondents agree that the use of clear masks may provide the option to lip-read, which is supported by previous study showing that a transparent face mask, such as the one used here, does not decrease the acoustic integrity of the speech signal and offers speechreading advantages for listeners with severe-to-profound hearing losses over auditory-only conditions. It is anticipated that listeners with NH may show benefit with the transparent mask in more challenging listening environments where more noise exists. Mask wearing

causes a low-pass filter effect attenuating the higher frequencies (2000-7000 Hz) of the speaker's voice with decibel (dB) reduction ranging from 3 to 4 dB (medical mask) to nearly 12 dB for the N95 mask (respirator /FFP). 15

80% of respondents agree that the use of face masks has a negative impact on communication and 50% of respondents agree that poor communication is likely to result in patient dissatisfaction. 53% of respondents somewhat agree that poor communication is likely to result in unnecessary investigation. Study supports our study with conclusion that universal masking degrades speech quality and denies visual clues (e.g., lip reading, facial expressions). Individuals with hearing loss using American Sign language convey grammar and tone by body language/facial expression. Similarly, individuals with hearing loss rely on adequate lighting, face-to-face positioning, and lip reading to provide contextual clues and augment speech comprehension during normal encounters.¹⁶

Study was conducted on a smaller sample size and study more settings could have been used for better generalizability. Patient from different age could have been incorporated in study. Study was conducted for limited time period.

CONCLUSION

It is evident that most hearing-impaired patients are aware of the need to visualize facial expression to aid communication. Most hearing-impaired patients rely heavily on lip reading in addition to other facial expressions. Whilst the use of face masks is important in reducing the spread of COVID-19, this study found that their use has a negative impact on communication and hearing, especially for patients with hearing impairment. Covering the lower part of the face limits visibility of the face, removes visible cues that are used for speech reading the lips and mouth, and changes sound transmission. KN95 respirators and single-use surgical masks are recommended for use as they both dampen sound minimally (approximately 5 dB) and filter out small particles effectively. Health care service providers who attend to hearing-impaired patients should consider using an assistive listening system or sound reinforcement system to reduce vocal fatigue and improve audibility. Transparent or clear masks are also recommended as they may be helpful in lip-reading and conveying emotions.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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APPENDIX

The tables displayed below reveal the responses based on the questionnaire questions developed to investigate the effect of face mask use on hearing impaired patients and were collected from one hundred (100) patients in ENT Sligo university hospital Having reduced hearing. The data was collected by means of questionnaire which was given to the target groups. The respondents' responses are presented in systematic order. The numbers of respondents who participated in this research were displayed on the tables below depending on the level of their agreement or disagreement with respect to the question asked:

Question 1: I am aware of the need to see the facial expression of a person to aid communication, (Mean=5.40).

1, strongly disagree	2	3	4	5	6	7, strongly agree
2	4	3	6	33	32	20

Question 2: The use of face masks is important in reducing the spread of COVID-19, (5.88).

1, Strongly disagree	2	3	4	5	6	7, strongly agree
1	3	1	0	26	35	34

Question 3: The use of face masks has negative impact on communication and hearing, especially for patients with hearing impairment, (Mean=5.56).

1, strongly disagree	2	3	4	5	6	7, strongly agree
2	3	5	10	22	23	35

Question 4: Covering of lower part of the face using a face mask limit visibility of the face, (Mean=6.57).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	0	2	0	3	23	71

Question 5: Covering of lower part of the face using a face mask remove visible cues that are used for speech reading the lips and mouth, (Mean=6.13).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	3	4	0	9	32	51

Question 6: Covering of lower part of the face using a face mask change sound transmission, (mean=5.62).

1, strongly disagree	2	3	4	5	6	7, strongly agree
2	3	5	13	16	20	41

Question 7: Both visual and audible stimulation help in appreciating and understanding vocal stimuli, (Mean=5.4).

1, strongly disagree	2	3	4	5	6	7, strongly agree
2	4	9	6	24	26	29

Question 8: I rely heavily on lip readings in addition to other facial expressions, (Mean=64.8).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	1	2	0	6	21	69

Question 9: I find it far more difficult to lip read or recognize facial cues following the mandatory use of face masks, (Mean=6.41).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	1	2	4	4	20	68

Question 10: Patients with hearing impairment need to wear identifiable hearing disability signs or "hearing-impaired" badges (Mean=4.42).

1, strongly disagree	2	3	4	5	6	7, strongly agree
15	3	1	42	11	8	21

Question 11: Masks tend to muffle portions of high-frequency sound that are important to speech (Mean=5.02).

1, strongly disagree	2	3	4	5	6	7, strongly agree
3	8	11	22	6	18	32

Question 12: Lack of consideration or recognition of hearing impairment is among the leading barriers in health care service delivery (Mean=5.02).

1, strongly disagree	2	3	4	5	6	7, strongly agree
11	5	6	12	10	27	29

Question 13: Hearing-impaired patients should be accompanied by their family members or friends to translate consultations for them when seeking health care services, (Mean=4.35).

1, strongly disagree	2	3	4	5	6	7, strongly agree
9	21	10	14	6	12	28

Question 14: Poor communication is likely to result in poor health care outcomes, (Mean=6.02).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	1	12	3	6	18	59

Question 15: Poor communication is likely to result in patient dissatisfaction, (Mean=5.61).

1, strongly disagree	2	3	4	5	6	7, strongly agree
2	5	3	19	6	21	44

Question 16: Poor communication is likely to result unnecessary investigation, (Mean=5.05).

1, strongly disagree	2	3	4	5	6	7, strongly agree
4	10	8	16	11	19	32

Question 17: Poor communication is likely to result in discontinuity of care, (Mean=5.39).

1, strongly disagree	2	3	4	5	6	7, strongly agree
4	6	2	23	4	22	39

Question 18: Clinicians need to be mindful of patients with hearing impairment, (Mean=6.47).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	1	1	3	3	26	65

Question 19: The use of clear masks may provide the option to lip-read, (Mean=6.41).

1, strongly disagree	2	3	4	5	6	7, strongly agree
1	1	2	4	4	20	68