



Teleaudiology practice in COVID-19 pandemic in Egypt and Saudi Arabia

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ABSTRACT

Objective: To evaluate the audiologists' attitudes and practice towards teleaudiology, as well as to assess the audiological services provided in Egypt and Saudi Arabia during the COVID-19 pandemic.

Methods: A cross sectional study was conducted among 112 audiologists who were recruited through convenience sampling. Multinomial logistic regression was used to test the association between practice of tele audiology as a dependent variable and some independent variables.

Results: 25.4% of the studied sample were practicing tele audiology. Participants' age and attitude toward telemedicine were the independent predictors of tele audiology practice at p value ≤ 0.05 .

Conclusion: The tele audiology practice is essential. Therefore, raising the knowledge of audiologist about the great value of practicing tele audiology is very important, infrastructure, equipment, and technology especially telecommunication should be improved and facilitated for both audiologist and patients.

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1. Introduction

By the end of 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) aggressively spread over the world (Bogoch et al., 2020; Chaudhary, 2020). There is no obvious data about the real onset of this syndrome. Growing evidence suggests that the SARS-CoV-2 was spreading globally months before the first case in Wuhan (Apolone, 2020). By the end of January 2020, World Health Organization (WHO) declared that the COVID-19 outbreak can be categorized as a pandemic. A pandemic could be defined as an epidemic disease that is spread all over the world (WHO, 2020 a, 2020b, 2020c). By December 1, 2021, the total number of confirmed cases had surged to 263,178,403, with more than 5,215,745 deaths (WHO, 2021).

World Health Organization (WHO) obliged numerous orders as a trial to reduce the transmission of the fast-evolving COVID-19 pandemic. Those orders consist of maintaining social distancing, encouraging people to stay at home, except for the importance of

basic services, travel restrictions, and hand hygiene (WHO 2020d).

The rapid spread of COVID-19 had medical, educational, psychosocial, and economic impacts, also audiology clinics have been affected by the pandemic. Audiology clinics were obligated to cancel many existing clinical appointments and only observe urgent patients in order to decrease physical clinician-patient contact. Audiologists across the world had little time to arrange for the choices and changes that must be made (Coco, 2020). To stay in contact with patients and minimize interference with care, many audiologists considered teleaudiology as a way to overcome these effects of the COVID-19 pandemic. Telehealth is the provision of health care remotely using telecommunication technologies. Although it expands the access to hearing care. Teleaudiology is accustomed deliver distant audiological assessments and interventions. (Calvillo et al. 2015; Coco, 2020),.

An international survey was conducted on audiologists from 28 countries and concluded that almost all audiologists have not trained in teleaudiology, and only 15% of them had an experience with teleaudiology (Coco, 2020; Eikelboom, and Swanepoel, 2016a). Previous researches examined the attitudes toward teleaudiology among audiologists and reported that most of them were unwilling to apply teleaudiology while doing the hearing assessment for children and older patients, performing hearing aid fitting, and mapping cochlear implant (Singh et al., 2014; Kimball et al., 2018). Singh et al. (2014) clarified that the telepractice could

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affect the relationships, communications and interactions with new patients. In contrast, Ng et al. (2017) stated that the use of tele-audiology in hearing aid fitting and programming was associated with positive feedback and patients' satisfaction, as it removed the barrier between patients and audiologists and allowed them to ask in-depth questions. Today smartphone-connected hearing aids can be fully programmed remotely. Zaitoun et al. (2021) investigated Jordan audiologists' knowledge of telehealth, they reported that half of the audiologists were not aware of the term teleaudiology. The audiologist thought that the teleaudiology services can be used only in counselling and hearing aid follow. Zaitoun et al. (2021) concluded that the main obstacles with audiologist to practice the teleaudiology were the availability of the equipment and lack of experience.

It is important to continue the use of teleaudiology even after the end of the pandemic. As the availability of remote audiological services may be a solution for many situations, particularly those with mobility or other health issues and transportation barriers (Coco, 2020). Also, may be helpful in developing countries where the ratio between the audiologists and hearing-impaired patients is about 1 per 20,000 which resulted in underserved patients ((Zaitoun et al., 2021; Kim, 2010).

Therefore, the aim of this study to evaluate the audiologists' attitudes and practice towards teleaudiology, as well as to assess the audiological services provided in Egypt and Saudi Arabia during the COVID-19 pandemic.

2. Methods

2.1. Study design

This study was a cross-sectional one which is a type of observational study in which both exposure and outcome are examined at the same point of time.

2.2. Population and sitting

The study was conducted among audiologists over a period of 2 months (April–May 2021) in Egypt and Saudi Arabia.

2.3. Inclusion criteria

The audiologist had to have experience in clinical sitting for at least 1 year to be familiar with different services of audiology.

2.4. Sample size and sampling technique

A sample of 112 audiologists were recruited through convenience sampling technique which is a non-probability sample characterized by being ease of access.

2.5. Research tools

A structured questionnaire was designed by researchers. The questionnaire consisted of 3 sections, the first section comprised 6 demographic questions; gender, age, working experience in years, working place, country and degree held by audiologists.

The second section consisted of 8 questions to assess the practice of tele audiology, satisfaction with tele audiology and challenges facing it from the audiologists' perspective.

The third section consisted of 3 questions to assess the perception of tele audiology and one question to assess attitude toward tele audiology practice.

The research tool content validity was assessed by 6 experts in the field, and the scale validity index/average was 1.

2.6. Data collection

Data was created by google forms and was distributed through professional and personal networks, and via social media platforms to the audiologists in Egypt and Saudi Arabia.

Ethical approval

The ethical approval was obtained from the institutional review board of Princess Nourah Bint Abdelrahman University (21–0142). The participants of the current research were informed about the purpose of the study which was stated at the beginning of the questionnaire. The anonymity of the participants was preserved, and they were assured about the confidentiality of their data and that it will be used for the purpose of the research.

3. Data management

The data were analyzed using SPSS version 25, IBM Corp (NY, United States). The data were presented in frequency tables using numbers and percentages. The association of practice of tele audiology and some related factors was tested using Pearson chi-square with significance at p-value ≤ 0.05. Multinomial logistic regression was used to determine the association of practice of teleaudiology as a dependent variable and the independent predictors at p-value ≤ 0.05.

4. Results

The total number of participants in the current study was 112, females constituted 89.3% of them. 64.3% of the sample were from Saudi Arabia and 35.7% were from Egypt.: 50% hold bachelor's degrees and 48.2% had less than 5 years of experience in audiology. 46.4% of the studied sample worked in governmental hospitals (Table 1).

42.8% of the participants perceived tele audiology as a practical approach in the current situation, also, 42.8% of them were neutral.

Table 1
Characteristics of studied participants.

	No.(%)
Gender	
Female	100(89.3)
Male	12(10.7)
Age	
20–29	54(48.3)
30–39	22(19.7)
40–49	26(23.1)
50–	10(9.9)
Country	
Egypt	40(35.7)
KSA ^a	72(64.3)
Degree	
AuD	12(10.7)
Bachelor	56(50.0)
Masters	18(16.1)
MD	16(14.3)
PhD	10(8.9)
Years of experience	
Less than 5	54 (48.2)
5–10 years	14 (12.5)
More than 10	44 (39.3)
Place of work	
University hospital	36(32.1)
Governmental hospital	52(46.4)
Private clinic	24(21.4)
Total	112(100)

^a Kingdom of Saudi Arabia.

Table 2
Perception, attitude and practice of tele audiology among studied participants.

	No.(%)
Tele audiology is a practical approach for providing audiological care services to patient in the current situation	
Agree	48(42.8)
Neutral	48(42.8)
Disagree	16(14.4)
Tele audiology save time	
Agree	52(46.4)
Neutral	34(30.4)
Disagree	26(23.2)
Tele audiology save effort	
Agree	48(42.8)
Neutral	36(32.1)
Disagree	28(25)
Attitude toward practice of tele audiology	
Agree	18(16.1)
Neutral	78(69.6)
Disagree	16(14.3)
Do you Practice tele audiology	
No	82(69.5)
Yes	30(25.4)

Also, 46.4% agreed that tele audiology save time and 42.8% agreed that teleaudiology saves effort. Only 25.4% practiced tele audiology and only 16.1% had a positive attitude toward practice of tele audiology (Table 2).

Table 3 described the practice of tele audiology and shows that audiologists communicated with patients through three methods, telephone or mobile, live video conference, and social media by 93.3%, 40% and 86.7% respectively. The most used services in tele

Table 3
Tele audiology Practice during COVID Pandemic.

	No.(%)
How do you communicate with the patient	
Telephone or mobile	28(93.3)
Live video conference	12 (40)
Social media	26(86.7)
Audiological services do you use in Tele audiology	
Audiometry (adults)	3(10)
Audiometry (children)	2(6.7)
Newborn screening	2(6.7)
ABR (adults)	0(0)
ABR (children)	2(6.7)
CI fitting	12(40)
CI trouble shooting	14(46.7)
Hearing aid fitting/trouble shooting (adults)	10(33.3)
Hearing aid fitting/trouble shooting (children)	8(26.7)
Vestibular function testing	2(6.7)
Counseling	22(73.3)
How often do you use tele audiology with your patients	
On emergency	2(6.7)
On request	24(80)
Specific time per week	4(13.3)
Are you satisfied with the results of teleaudiology	
Satisfied	10(33.3)
Not satisfied	20(66.7)
Patients' satisfaction with tele audiology service (practitioner perspective)	
Satisfied	12(40)
Not satisfied	18(60)
Challenges for practitioners	
Not able to provide full range of services required by patients	90(80.4)
Unavailability of equipment	66(58.9)
Unavailability of trained staff	44(39.3)
Preference to see patient face to face	54(48.2)
No internet access	4(3.6)
Audiological evaluation is not applicable in tele audiology	24 (21.4)
There are no challenges	4(3.6)
Challenges for patients (practitioner perspective)	
They are reluctant to access teleservices	38(33.9)
Cannot use electronic communication	58(51.8)
Patients resists tele audiology	34(30.4)
There are no challenges	10(8.9)

CI: Cochlear implant.

ABR: Audiometry brainstem response.

Table 4
Association between tele audiology practice and some related factors.

	Practice of tele audiology		p value ^a
	Yes	No	
Gender			
Female	24(24)	76(76)	0.08
Male	6(50)	6(50)	
Age			
20–29	12(22.2)	42(77.8)	0.003
30–39	2(9.1)	20(90.9)	
40–49	10(38.5)	16(61.5)	
50–	6(60)	4(40)	
Country			
Egypt	10(25)	30(75)	0.6
KSA	20(27.8)	52(72.2)	
Degree			
AuD	4(33.3)	8(66.7)	0.6
Bachelor	12(21.4)	44(78.6)	
Masters	6(33.3)	12(66.7)	
MD	8(30.8)	18(69.2)	
Years of experience			
Less than 5	12(22.2)	42(77.8)	0.2
5–10 years	16(36.4)	28(63.6)	
More than 10	2(14.3)	12(85.7)	
Place of work			
University hospital	10(27.8)	26(72.2)	0.97
Governmental hospital	14(26.9)	38(73.1)	
Private clinic	6(25)	18(75)	
Perception of tele audiology			
Poor	12(25)	36(75)	0.7
Good	18(28.1)	46(71.9)	
Attitude toward tele audiology			
Agree	14(77.8)	4(22.2)	0.00
Neutral	10(12.8)	68(87.2)	
Disagree	6(37.5)	10(62.5)	

^a Pearson chi square.

audiology were counseling, cochlear implant troubleshooting, cochlear implant fitting by 73.3%, 46.7% and 40% respectively and 80% of them used tele audiology on request. 66.7% of audiologists in this study were not satisfied with tele audiology while 60% of them see that their patients were not satisfied.

The most challenges to tele audiology practice stated by the participants were the inability to provide full range of services required by patients and the unavailability of equipment by 80.4% and 58.9% respectively. 51.8% of the participants stated that the challenges for patients to use teleaudiology was the inability to use electronic communication (Table 3).

38.5% of the participants in the age group 40–49 years old were practicing tele audiology and it was statistically significant. 77.8% of them had a positive attitude toward teleaudiology which was statistically significant (Table 4).

Multiple logistic regression revealed that age and attitude toward telemedicine were the only significant independent

Table 5
Multiple logistic regression of tele audiology practice among studied participants.

Effect	–2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	64.587 ^a	0.000	0	.
Perception of tele audiology	66.374	1.787	1	0.181
Attitude toward tele audiology	108.209	43.622	2	0.000
Age	76.724	12.137	1	0.000
Gender	64.680	0.093	1	0.760
Country	64.680	0.093	1	0.760
Degree	72.374	7.787	3	0.051
Working place	70.777	6.190	2	0.055

df: degree of freedom.

predictors of tele audiology practice (Table 5).

• 20-29	12(22.2)	42(77.8)
• 30-39	2(9.1)	20(90.9)
• 40-49	10(38.5)	16(61.5)
• 50-	6(60)	4(40)

5. Discussion

COVID-19 pandemic had grave effects in different aspects all over the world including the audiology clinic (Hull, 2005). In this condition, tele-audiology can play an important role in minimizing gaps in care and keeping in contact with patients in order to face the impact of the COVID-19 pandemic. In spite of the great need to apply tele-audiology in these conditions, previous research found that audiologists had shown a reluctant attitude toward tele-audiology (Singh et al., 2014) and never engaged in its practice (Coco, 2020). Therefore, it was necessary to tackle such a problem in order to evaluate the attitude and practice of audiologists toward tele-audiology and to assess the audiological services provided in Arab counties during the COVID-19 pandemic.

The current study was a cross-sectional study which was conducted in Egypt and Saudi Arabia upon 112 audiologists who filled a questionnaire assessing their perception, attitude, and practice toward tele-audiology. The majority of participants were females (89.3%) and approximately half of them (48.3%) were less than 30 years old reflecting the nature of the audiological workforce. Half of our sample hold bachelor's degrees and 48.2% had less than 5 years of experience in audiology which showed an even spread of qualifications (Table 1). The findings of our study revealed that 42.8% of the participants perceived tele audiology as a practical approach in the current situation, and the same percentage was neutral (Table 2). This result was less than the result of a survey conducted by ASHA about tele-practice use among audiologists and pathologists that found that 97% of participants perceived it as a useful tool in their practice (ASHA, 2017). This difference may be explained by that, the deficiency in technological resources in Arab countries may hinder the easy communication with patients, as many areas have weak mobile networks and do not have internet.

46.4% of audiologists in the current study agreed that tele-audiology saves time, and 42.8% agreed that it saves effort (Table 2). Previous studies were in agreement with our findings and one of them mentioned that; tele-audiology helped those patients with slight access to healthcare (71%) and decreased the cost of audiology services (45%) (Schonfeld, 2016). Another study revealed that audiologists believed that tele-audiology had a minimal impact on the client-practitioner interactions and it increased the

overall quality of care in audiology (32%) and decreased travel demands for patients (Singh, 2014).

Despite the good perception of our respondents to tele-audiology, only 16.1% of them showed a positive attitude toward practicing tele-audiology and 25.4% had already practiced it (Table 2). This result was consistent with the result of a previous study that found that 15.5% of its respondents had practiced tele-audiology while their attitudes toward tele-audiology and willingness to use it were generally positive (Eikelboom, and Swanepoel, 2016a). On the other hand, a higher percentage of a positive attitude toward tele-audiology has been recorded by other studies (Singh, 2014). There are many possible explanations for this gap between the perception and actual practice finding, might be lack of infrastructure, tools, and technologies for both practitioner and patient, the tools and technologies that can be used for tele-audiology need to be in place to provide better services with more publications on services that are in place, and lack of investments in infrastructure and resources as well as trained audiologists. Another possible explanation for these low percentages of positive attitude and practice toward tele-audiology is that the physicians in most of the Arab counties do not receive any compensation for the telemedicine services as consulting via telephone calls, or social media. By contrast, in other developed countries many health plans have increased the physician's compensation for telehealth and telemedicine services particularly in response to the COVID-19 pandemic as a keen attention to compensation is a necessity (Volk et al., 2021).

Regarding the practice of tele-audiology, our study showed that, audiologists communicated with patients through three main methods; telephone or mobile, social media, and live video conferences by 93.3%, 86.7%, and 40% respectively (Table 3). However, a previous study revealed that, most audiologists had preferred to use live video conferences and smartphones by 90%, and 81.8% respectively (Eikelboom, and Swanepoel, 2016a). This difference may be related to the available tools, technologies, and infrastructure that varies in different countries.

Previous studies showed that, tele-audiology can provide variable health services including live or store and forward consulting (Eikelboom, and Swanepoel, 2016b), screening and diagnostic audiometry (Swanepoel et al., 2014; Eikelboom et al., 2013), hearing aid rehabilitation (Campos and Ferrari, 2012), and cochlear implants (Eikelboom et al., 2014). In the present study, the most used services in tele audiology were counseling, cochlear implant troubleshooting, cochlear implant fitting by 73.3%, 46.7%, and 40% respectively and 80% of them used tele-audiology on request (Table 3). 66.7% of audiologists in this study were not satisfied with tele-audiology while 60% of them saw that their patients were not satisfied. On the contrary, a previous study recorded high satisfaction ratings by both audiologists (72.7 good) and patients (87.3% excellent) (Thrum, 2018). Other tele-audiology studies reported reasonable patient satisfaction toward remote hearing aid services, fittings, and programming (Penteado et al., 2014; Pross et al., 2016; Reginato and Ferrari, 2014).

In the current study, the most obvious challenges facing tele audiology practice among the audiologists were the inability to provide the full range of services required by patients (80.4%), unavailability of equipment (58.9%), and preference to see patients face-to-face (48.2%). 51.8% of the participants stated that the challenge for patients to use tele audiology was the inability to use electronic communication (Table 3). These challenges were concordant with the results of other studies that mentioned that, the main challenges reported by audiologists were lack of facilities and technology for the practitioner as well as the patient, lack of trained professionals, and reduced quality when compared to face-to-face interactions (Eikelboom, and Swanepoel, 2016a; Schonfeld,

2016). Similar studies revealed that, geographical barriers, technological limitations, the necessity for software information, and the limited speed of the internet restricted the use of tele-audiology in speech, language, and hearing sciences (Fabry, 2010; Molini-Avejonas, 2015).

In the present study, we noted a statistically significant association between the practice of tele-audiology and the participants in the age group 40–49 years old (38.5%) as well as those with a positive attitude (77.8%) (Table 4). The multiple logistic regression confirmed that age and positive attitude toward telemedicine were the only significant independent predictors of tele-audiology practice (Table 5). This finding can be explained by that, the older the age of audiologist the more experience so it is easier to deal with the patients without the need to face to face interaction. A previous study reported that, there was no significant association between the practice of telehealth and the age of audiologists (Eikelboom, and Swanepoel, 2016a).

In summary, the results of the current study emphasized that the majority of audiologists showed a negative attitude toward tele-audiology and did not practice it and the most challenges facing tele-audiology practice were the inability to provide the full range of services, unavailability of equipment, and preference to face to face interaction. The only significant independent predictors of tele-audiology practice were age and positive attitude toward telemedicine.

6. Conclusion and recommendations

This study was done to evaluate the attitude and practice of audiologists toward teleaudiology and assess the audiological services provided in Arab counties during COVID-19 pandemic. The teleaudiology practice is essential in this condition. Therefore, we praise the need to raise the knowledge of audiologists about the great value of practicing teleaudiology. Also, infrastructure, equipment, and technology especially telecommunication should be improved and facilitated for both audiologist and patients. Finally, due to the limitations of cross-sectional study further studies should be conducted to assess the causal effect relationships between different related factors and the practice of teleaudiology.

Limitations of the study

There was no inputs from patients regarding satisfaction and challenges to use teleaudiology as they were studied from audiologists' perspective.

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Declaration of competing of interest

The authors declare that there is no conflict of interest.

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