A Systematic literature review of the impact of using ear buds for cleaning ears in children and adults

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ABSTRACT

Ear wax lubricates, cleans and moisturizes the canal by trapping the dirt and repelling any water that could enter the canal. A common misconception is that self-cleaning is a hygienic practice. However, the continuous use of ear buds causes injuries to the ear exposing it to bacterial infections like otitis externa. This systematic review assesses the existing knowledge on the use and impact of ear buds. It further identifies alternative methods of cleaning the ears that are safer, effective and affordable. Lastly, the review aims to find knowledge gaps existing in Kenya for further research. Using the PRISMA method, a comprehensive literature review was conducted to help in achieving the objectives of the study. About 105 articles were considered and 70 screened. Out of these, 23 articles were included in this literature review. The results agree that there is a general lack of awareness on the risks of cotton buds use for self-cleaning all over the world and in Kenya. Ear buds use for self-cleaning has been reported to cause wax compaction, otitis externa, ear blockage and temporary hearing loss. Alternative methods found effective include irrigation, the use of olive oil or ear drops with betamethasone, use of sodium bicarbonate or solution of docusate sodium-based. The study concludes that there is need to raise awareness and recommends the review of policies on marketing strategies for ear bud use, the training of healthcare professionals and rolling out of educational material or campaigns to teach alternative ways of ear cleaning.

Keywords: *cotton buds, hazards, awareness, ear infection, ear wax, self-ear cleaning*

INTRODUCTION

The use of ear buds has been a common habit in most of the societies in the world as a way of self-cleaning the ears to eliminate or clear ear wax, which is considered dirt (Khadka et al., 2023; Alhazmi et al., 2022). It has been reported that the general population, even some health care workers, have poor or little knowledge of the functions of the ear wax or the serious consequences of using cotton buds for self-cleaning (Oladeji, 2015; Khan, 2017). These reports further explain that there is a common misconception of the practice alluding to self-cleaning as a form of hygiene. In one study on 391 individuals, it was reported that 50.1% of the respondents believed that cleaning the ears using ear buds was beneficial (Shawish et al., 2023). In contrast, the same study reported that 62.7% of all the respondents knew about the damage caused by using cotton buds and 55% of all the respondents knew about the complications attached to the use of cotton buds.

However, ear wax commonly referred to as cerumen, is secreted naturally by the sebaceous and ceruminous glands in the external auditory canal (EAC). Contrary to popular knowledge (Oladeji, 2015), ear wax is meant to lubricate, clean and moisturize the canal and therefore is able to naturally clean the ear through trapping the dirt and repelling any water that could enter the canal (Alruwaili et al., 2021). The cerumen is secreted within the cartilaginous external auditory canal hence validating its function for the ear cleaning process. However, the bony EAC does not need cleaning since it is covered with smooth skin. Studies have found the presence of ear wax in this region due to these self-cleaning habits that push the wax further down the canal (Nagai & Okamoto, 2022).

The cotton ear buds are not only too large to enter the ear canal but also the stick attached may lead to ear injuries due to constant poking. Nagai & Okamoto (2022) further report that the habitual use of self-cleaning techniques to remove ear wax may lead to perilymph fistula and other inner ear disorders like dizziness, hearing loss and vertigo. Cotton bud use has also been associated with the development of Otitis Externa, which is a condition that results in the inflammation of the external ear canal and manifests as redness and swelling (Zia et al., 2019; Wiegand et al., 2019). It is, therefore, evident that there is a gap in knowledge on the use and impact of the cotton buds for cleaning in any society.

This study aims to determine the knowledge of the use and impact of ear buds among the population in Kenya. The specific objective is to determine the association of the level of knowledge and the use of ear buds for cleaning. This information will help inform the study on how to improve awareness among the patients in private hospitals in Kenya for better ear care. This paper argues that there is a general lack of knowledge among people on the use and eventual impact of the cotton buds or q-tips for cleaning their ears. Further, the study stresses the impacts of this habit as deteriorating for individuals who utilize self-cleaning techniques for their ears. It has been hypothesized that a large population of Nairobi, Kenya regularly use cotton buds without the knowledge on the adverse effects associated. Hence a need for creating awareness on better ear care. This systematic review aims to assess the existing knowledge on the use and impact of ear buds for ear cleaning. It further aims to identify

alternative methods of cleaning the ears that would be safer, effective and affordable to the normal population. Lastly, the review aims to find knowledge in Kenya and identify the major gaps that are present for further research.

LITERATURE REVIEW

Ear wax and its purpose

Ear wax, otherwise referred to as cerumen, is a naturally occurring substance produced in the 'lateral third of the external auditory canal' and serves as a mechanism of protecting this region from pathogens through trapping foreign particles (Agrawal & Deshmukh, 2021). The existence of earwax is the divide between hearing and deafness. The properties of ear wax give it its functional characteristic: the oily substance acts as a lubricant of the tympanic membrane, otherwise referred to as the ear drum. While the bitter property of the ear wax poses as a prevention of dirt, insects and other bodies from entering and causing bruises in the ear. Further, (Verwaal, 2021) highlights that the ear wax has a function of softening the 'sonorous vibrations of the air and moderate loud noise'. However, too thick of ear wax may cause hearing impairment, dried ear wax may also cause blockage of the ear passage leading to severe deafness. This buildup of cerumen causing blocking of the ears hence discomfort, hearing loss, dizziness leading to otitis externa may lead to the use of objects to help in easing these issues. Therefore, the use of cotton buds for cleaning and removal of the ear wax. Accumulation of ear wax may present a risk of ear skin safety and anatomical deformity. Hence the need to have health care practitioners use a specific skill to clean the ears and reduce the ear wax accumulation (Rodríguez et al., 2022). Use of cotton buds reduces the lubrication in the ear, which exposes the ear to severe infections. Health care practitioners have been using either water-based, oil-based or non-water/non-oil based techniques to clean the ear canal.

Use of cottonbuds and its effects

Bukhari et al. (2021) conducted a study on the possible effects of using cotton buds or other type of objects in removing ear wax or itching of the ears and found that there are negative effects associated. The study found that the use of these objects including the cotton buds resulted in wax impaction, ear wounds, acute otitis externa, neurodermatitis, contact dermatitis, perichondritis of the external ear, foreign body external ears and tympanic membrane perforation. The study provided recommendations on how to control itchiness of the ears to prevent the use of cotton buds or these other objects. Some of these solutions include treatment immediately, conducting follow up visits to get counselling on how to quit self-ear cleaning, the use of ear drops that have Betamethasone and Neomycin that may help in controlling the urge to scratch their ears.

Infections caused in the external auditory canal were related to the use of cotton buds during cleaning of ears. This study by Beigh & Khalid (2022) was meant to treat patients with resistant otitis externa a trauma infection caused by the use of cotton buds. The study put much emphasis on focusing on the history of the patient and how often they used cotton buds to clean their ears. The study further recommended that people use proper medication to control the itching or any cleaning prescribed by the doctors to

prevent the increase in ear infections. The study confirms that the external auditory canal is naturally present in normal bacterial flora and thus cannot be infected unless the major defense mechanism is affected. In this context, the study refers to the use of cotton buds as disruption of this defense mechanism, which causes a development of new pathogenic flora dominated by *Pseudomonas aeruginosa* and *Staphylococcus aureus* that has been found to be the main cause of resistant otitis externa. The study further recommends antibacterial therapy for otitis externa and the use of ear drops to decrease any inflammation or edema in the canal.

In another study on examination of diseases of the external ear, it was found that a person suffering from diseases in the external ear was 16.07 times more likely to have been exposed to a risk factor like the use of cotton buds (Bukhari et al., 2021). The study highlights that for those people who had been using cotton buds, they expressed the otitis externa. Many of the respondents were not aware of the adverse effects of using cotton buds for self-cleaning. Among the objects that were revealed for this study included the use of cotton buds, fingers and a matchstick mainly to reduce itching and to remove filth. The study recommends having community mindfulness talks using social media platforms to expose the people to the adverse effects of the use of cotton buds for cleaning.

Some of the dermatological conditions in the ear associated with the use of cotton buds as described by Ahmed et al. (2014), include acute otitis externa, neurodermatitis, contact dermatitis of the external ear, and rupture of tympanic membrane that may lead to permanent deafness. This study found a clear positive correlation of the manifestation of the ear diseases with the use of cotton buds. The study highlights further that despite having warnings from the manufacturers and the health workers, the people who showed disease manifestation, were very 'ignorant' of the ear effects of using cotton buds. Some of the recommendations that were proposed were on 'fortifying' the information and warnings given by the manufacturer at different educational levels.

In another study, it was found that many adults actually believed that the ear needed regular cleaning and hence the use of the cotton buds. The main reasons for using the cotton buds were compiled after conducting a questionnaire and it was found that itching, personal hygiene and removal of wax topped the list. Other reasons include a feeling of irritation, hearing impairment, ear blockage. Besides otitis externa, revealed profoundly by other authors as the main consequence of using cotton buds, Adegbiji & Aremu (2018) state that otalgia results from bruises caused by using cotton buds, while ear wax compaction was found to prevent sound wave conduction to the tympanic membrane that would eventually lead to hearing loss or impairment. The study concludes that many of the respondents did not know about the effects of the use of cotton buds to their health, while some new based on information from family or neighbors. However, more awareness and education was recommended as the most probable way of solving the issue on alternative ways of 'ear cleaning' and conservative treatment for the diseases affecting the ear that were associated with the use of cotton buds.

Self-cleaning of ears is clearly a common practice everywhere in the world and the use of cotton buds is evident even in the rural and remote areas. (Gabriel et al., 2015)

conducted a study in a community in Nigeria and concluded the same issue where 74% of the respondents were not aware of the dangers associated with the use of cotton buds in cleaning the ears. There was a general misconception of the benefits of using cotton buds to clean the ears to relieve itching. It was recommended that increase in awareness through public education and utilizing the school health programmes to teach children would help in better decision making on self-cleaning techniques and more reliance on expert advice rather than questionable traditions.

In considering another location, Jazan Saudi Arabia, many of the respondents in a study on knowledge of using cotton buds were found to have knowledge on the negative effects of using them (Shawish et al., 2023). However, even knowing this, cotton buds were still being used as the primary objects to clean ears hence causing ear related complications. The study still recommended raising awareness to address the mixed awareness situation in that community by involving health professionals like primary care givers on the potential risks of using cotton buds for cleaning ears. A different study in Riyadh, Saudi Arabia, had almost similar findings with the majority of the respondents having good level of knowledge about the negative effects of using cotton buds for cleaning (Abdulrahman et al., 2022). However, they still used the cotton buds for self-cleaning. It was still evident that there were complications associated with this practice that manifested as ear disease like otitis externa.

METHODS

Study design

This systematic review followed the PRISMA guidelines in getting information on the knowledge and impact of using ear buds/cotton buds for self-cleaning. The study further discussed the most effective solutions that have been adopted by other physicians on tackling the same issue. The implication of the study is to realize adoption of some of these solutions in the Kenyan population specifically.

Search strategy

Articles, through a comprehensive literature search, published from 2014 to 2024 in English using databases like PubMed, Medline, Sagepub, Research gate and Google Scholar were used for this systematic literature review. The selection period covered about ten years on the effect of using cotton buds for self-ear cleaning and the knowledge of these effects by the respondents. The keywords used for this research included “self-cleaning”, “cerumen”, “ear buds”, “cotton buds”, and “ear cleaning”.

The inclusion criteria involved the consideration of studies that target both adults and children, conducted all over the world for the first part of the study and then narrowed to participants in Kenya. This was done to ensure a proper comparison on the knowledge of these effects to help in deriving possible solutions. Further, the journals that were selected had to have information on the knowledge and awareness of ear wax and the subsequent removal, they had to have information on any effects or complications that were related to ear buds use and the effective and non-effective

solutions that have already been adopted in other studies. Lastly, the data was specific to a global population that had applicable settings as Kenya.

The exclusion criteria involved excluding those articles and journals that were not peer reviewed, any case reports or editorials were excluded, and any article that did not have any information on the use of ear buds, its impacts or solutions attempted to solve the negative impacts of using ear buds.

Data extraction and management

The process of screening the titles and abstracts of all the studies considered for the success of this research were done by two expert reviewers independently. An extraction excel sheet was used to collect the specific information on the contents of the different journals for example year of publication, study design, sample size, population characteristics, key findings, conclusions and recommendations.

Data analysis and synthesis

The research analysis and synthesis has used a narrative method and the results organized in themes to provide an in depth analysis and conclusion of the topic being discussed.

Ethical considerations

The study has been conducted considering secondary data and not primary data therefore, there was no need for ethical approval.

Limitations and conclusions

The main goal was to find out the gaps in the Kenyan Population but based in the findings there is a lack of studies that focus most especially in Kenya. Thus, the study may represent a level of generalizability of findings. This limitation can be taken as a possible avenue for further research. There could be a 'potential publication bias' and a variability in the quality of the studies that have been considered for this study. In conclusion, the results from this study can be adopted in the Kenyan context to provide solutions or ways in which ear wax removal can be safer for both adults and children.

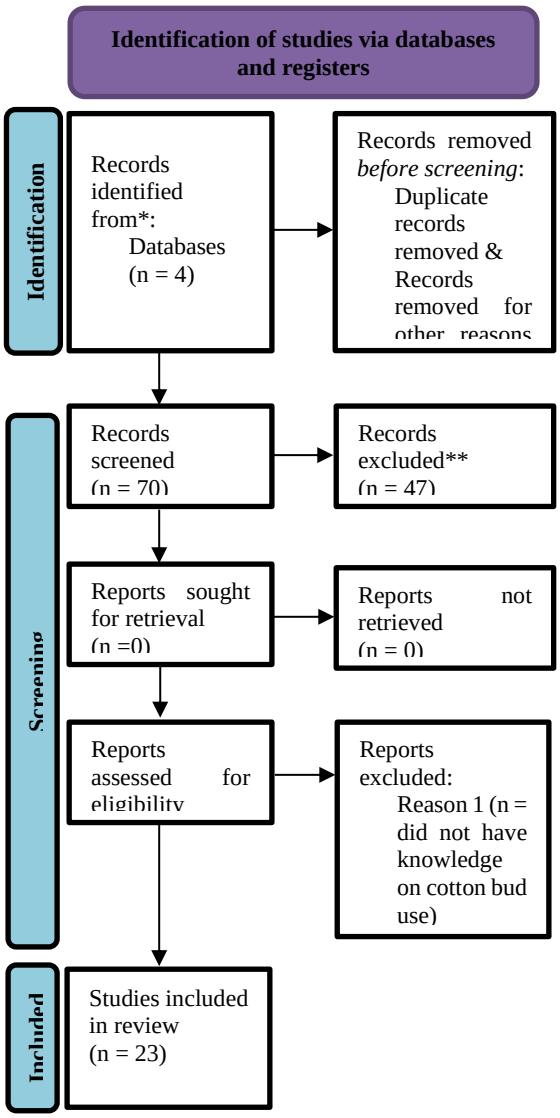
RESULTS

Study selection

All the articles searched through the different databases were 105 and, after elimination of duplicates, 70 were considered for full text review using key words like "cotton buds", "hazards", "awareness", "ear infection", "ear wax", "self-ear cleaning". After conducting a thorough search using the inclusion and exclusion criteria, 23 studies met the inclusion criteria and were considered for the review. However, the different studies varied in their research design and trials conducted. The process of conducting the review here used the PRISMA Flow diagram technique as shown in Figure 1.

Figure 1.

PRISMA flow diagram of the review process



Knowledge and use of ear buds

Considering the array of information on this research, it is evident that many people in different parts of the world are largely unaware of the impact of using ear buds for self-ear cleaning. The data collected highlight locations like Saudi Arabia, Kenya and Nigeria. A general lack of awareness on the damages caused by using the cotton buds was evidently presented and the consequent negative impact on the ears. In Kenya specifically there was not any data that addressed the use of ear buds for self-cleaning.

Consequences and complications of using ear buds

It was found that the use of ear buds has a negative impact on the ears in terms of exposure to ear infections like the development of otitis externa caused by bacteria like *Pseudomonas aeruginosa* and *Staphylococcus aureus* (Beigh & Khalid, 2022). It was also found that these foreign objects caused wax impaction (Adegbiji & Aremu, 2018), ear wounds, perichondritis of the external ear and tympanic membrane perforation (Bukhariet al., 2021).

Reasons for using ear buds

It was found that the main reasons for using cotton buds is to clean the ears of wax. Many of the respondents stated the feeling of itching, blockage of the ears, hearing impairment, personal hygiene, and removing of wax as part of the reasons for using cotton buds or other foreign objects for ear cleaning (Bukhari et al., 2021; Beigh & Khalid, 2022; Adegbiji & Aremu, 2018; Gabriel et al., 2015; Piromchai et al., 2020; Testa et al., 2022; Verwaal, 2021).

Alternative methods of ear cleaning

Different studies highlighted different solutions towards alternative ways of ear cleaning that would be less intrusive to the ear and may reduce chances of developing any infections, mild or severe. Some of the alternative ways that were found include the use of ear drops that have betamethasone and neomycin (Bukhari et al., 2021),

antibacterial therapy (Beigh & Khalid, 2022), adoption of irrigation using solutions like docusate sodium-based solution and sodium bicarbonate.

Table 1.

Table showing reported consequences of using ear buds and the consequent suggested interventions

Reported consequences	Suggested interventions
Bacterial infections	Use of antibacterial therapy (Beigh & Khalid, 2022)
Injury caused by constant bruising	Irrigation, ear drops that have betamethasone and neomycin (Bukhari, , et al., 2021)
Ear blockage, wax compaction	Irrigation using Docusate sodium-based solution or sodium bicarbonate (Srisukhumchai et al., 2020)
Excess ear wax	Water-based cerumenolytics such as Waxsol® and hydrogen peroxide (Tynan et al., 2020)
Earwax blockage, perforated eardrums, ear canal malformations, external ear infection	a medication containing alpha-tocopherol (vitamin E) and polydecene
Ear wax plugs	Use of olive oil

DISCUSSION

Knowledge and use of ear buds in Kenya

Based on the studies considered for this research paper, which have featured a global context of the use of cotton buds, its effects and the knowledge of the effects, it has been revealed that many people are not aware of the adverse effects of the use of cotton buds to clean their ears. They do not know of the dermatological conditions of the ear caused by using cotton buds. It is evident even having done many studies over the years that there is still an awareness gap that has been presented whether it was ten years ago or just in the previous year, 2023. In this section, the research study will focus on the existing knowledge of the effects of using cotton buds for ear cleaning in Kenya in comparison to the global context. The section will highlight the current solutions and probably give recommendations and possible solutions to using cotton buds for self-cleaning.

A comprehensive literature search was conducted to identify studies on the use of ear buds for earwax removal in Kenya, however, no studies were found that specifically addressed this topic. Developing countries are faced with limited access to research and this could explain why the literature on the use of ear buds in Kenya is unavailable, despite their use being common (Brkic, 2009). Ear health has not been prioritized in Kenya although ear complications have been reported in several studies including obstruction by ear wax (Simões et al., 2016; Brkic, 2009). The lack of literature on use of ear buds in Kenya for ear wax removal highlights the need for research to identify facts such as the extent of ear buds use, and the extent of knowledge of their adverse effects following their use.

Solutions to using ear buds

As seen, using an ear bud to clean ear wax has been reported to cause complications like damage to the ear canal, perforation of the eardrum, and other effects caused by pushing the earwax deeper and introduction of bacteria that may cause infections such as otitis media and otitis externa. Alternatives to use of cotton ear buds to remove earwax have been reported by several authors based

on their comparative effectiveness, safety and cost-effectiveness. Such alternatives include cerumenolytics, which can be applied through a process known as irrigation and removal using mechanical devices.

One solution to cleaning earwax buildup, as proposed by (Rodríguez et al., 2022) is the introduction of a user-friendly, hand-held tool that features a hollow stem for insertion into the ear canal and flexible bands within the stem. The device removes the wax by inserting it into the ear canal and activating the band that grips and removes the wax. This device is designed to be safe and user-friendly with a mechanism that prevents it from reaching the eardrum. The soft flexible bands ensure that the wax is not pushed further into the eardrum. The device is easy to use without requiring medical expertise. The materials chosen for the tool are biocompatible; the stem and plunger are made from polymethyl methacrylate (PMMA) due to its stiffness although alternatives such as polyethene terephthalate (PET), nylon and acrylonitrile butadiene styrene (ABS) can be used, while the bands are made with plasticized polyvinyl chloride, chlorinated polyethylene silicon, polylactic acid (PLA) or elastomeric blends for flexibility, and the grip and stop made from ABS or PET for rigidity to handle the tool and prevent damage to the ear canal. The authors however mention the limitations of this invention such as it may not be effective for already formed earwax plugs as it may push them deeper and potential public resistance to change their ear cleaning habits and they acknowledge the need for further research before commercialization.

Olive oil is a wax softener and it is widely believed that it can apply olive oil drops regularly can help reduce wax buildup. Levy (2024) carried out an experiment using 60 participants divided into groups receiving olive oil in different frequencies and amounts in their left or right ears and earwax buildup monitored every 4 weeks for 24 weeks to test the belief that olive application reduces earwax buildup. The author reported that there was no reduction in earwax buildup as most participants' ears receiving olive oil showed greater wax accumulation compared to control ears. It was also observed that applying a smaller amount of olive oil twice a week was slightly more effective than using a larger amount once weekly (Levy, 2024). The author attributes the ineffectiveness of olive oil to its ability to adsorb water from dry earwax which causes it to swell and take up more space in the ear canal. Some of the limitations of this research include the fact that a small sample of 60 participants was used, the potential for bias from the researcher visually examining earwax buildup and reliance on self-reported adherence to olive oil application schedule.

Another study (Domenico et al., 2022) investigated the effectiveness of an earwax removal spray called Filme Oto Spray which is a medication containing alpha-tocopherol (vitamin E) and polydecene. Participants from this study were 137 patients aged 3-80 years with complete earwax blockage in both ears divided into three groups (Testa et al., 2022): children (3-18 years old), adults (18-60 years old) and elderly (over 60 years old) while people with perforated eardrums, ear canal malformations, external ear infection, prior ear surgery or allergies to the spray excluded. The participants received the spray 3 puffs in each ear, 3 times a day for seven days or 14 days and the ear wax blockage was examined through otoscopy and scored using a scale of 0 to 3 (0=complete blockage,

3=no blockage) at three time points: before treatment, after 7 days and after 14 days. The authors report that the spray effectively removed earwax plugs in most patients (76/137) after seven days of use and children responded better to the spray than older adults. The spray was well-tolerated and no side effects were reported. This method was found to be more convenient and preferred by patients compared to methods such as irrigation and manual removal. However, this study is retrospective as the authors examined past medical data rather than conducting a controlled experiment and more research is needed to confirm the spray's long-term efficacy and compare it to other it to other earwax removal methods.

Over the counter cerumenolytics for ear wax are available and one research (Tynan et al., 2020) compared the effectiveness of several cerumenolytics categorized into water-based "(Waxsol®, hydrogen peroxide, Aqua Ear®, Cipro®HC, Sofradex®, Co-phenylcaineTM Forte and sterile water), oil-based (Olive oil and CleanEars®) and Non water/oil (Earclear)". Earwax samples were manually extracted from 12 patients visiting an ear, nose and throat clinic in Queensland and categorized into 3 consistency levels (soft, medium or hard) by two independent observers. A standardized sample of the earwax was treated using the aforementioned cerumenolytics for 5 minutes and the effects were assessed based on a dissolving scale (0=unchanged, 3=over 75% dissolved) and softening scale (0=unchanged, 2=completely softened) by two independent observers. Statistical analysis was performed to compare the effectiveness of the different cerumenolytics on softening and dissolving earwax. The authors reported that water-based cerumenolytics were more effective compared to the other classes and that sterile water was the most effective but due to the increased risk of otitis externa it should be avoided. This study also agrees with Levy (2024), that despite the common belief, olive is not an effective cerumenolytic. The authors recommend using water-based cerumenolytics such as Waxsol® and hydrogen peroxide regardless of earwax consistency. The study was however limited by the short observation period and that the effectiveness of the cerumenolytics was not studied on real people.

Piromchai et al. (2020) investigated the efficacy of 2.5% sodium bicarbonate and docusate sodium on 91 participants with complete ear canal blockage as a result of earwax through a randomized design. Each of the participants received either of the solutions, and neither the participants nor researchers knew which solution was administered. The solution was allowed to sit in the participant's ears for 15 minutes after which the ear canals were cleaned for up to 3 minutes through suction. Data on cleanliness success (indicated by whether the eardrum became visible after cleaning) the amount of time it took to remove the earwax and any discomfort reported by participants was recorded (Piromchai et al., 2020). Although there was no statistical difference between the two groups, the authors recommend sodium bicarbonate due to few side effects and the fact that it is readily available at a low cost compared to sodium docusate. A small sample (n=91) was used which might have resulted in a lack of definitive differences between the two treatments. In addition, the study did not consider the consistency of the earwax (soft, medium or hard) and the solutions might have different effects depending on the consistency of the earwax.

Docusate sodium-based solution (Audilyse®) was also used in another study as a pre-treatment before the irrigation procedure alongside other German water based (Alvita®) and oil based (Cerustop®) solutions. The study was conducted on 168 patients (298 ears) with their ear canals blocked by earwax, the pre-treatment solutions were applied 20 minutes before irrigation after which irrigation was carried out using the OtoClear® Ear Irrigation wash kit. This kit can hold 500ml water with a lever pump that could guarantee constant pressure, and a temperature measuring strip to ensure the right temperature (37ºC) to avoid vestibular caloric stimulation which can occur with a deviation of as low as 1ºC from the body temperature (Srisukhumchai et al., 2020). The procedure was successful in removing earwax in 208 out of the 298 ears (roughly 70%) but there was no significant difference between pre-treatment solutions and no pre-treatment. Although docusate sodium-based pre-treatment showed the highest success rate, there were no significant differences between the other pre-treatments. The authors also reported temperature related discomfort among some of the participants and irritation from the irrigation tip suggesting it might not be appealing to most people. The earwax consistency or individual ear canal anatomy may have influenced the effectiveness of the treatments and the study could have benefited from a larger sample size for more definitive results.

In consideration of the issue of awareness and a general lack of knowledge on the damages that cotton buds have on the ears, it is evident that there are knowledge gaps that should be addressed. It has been found that many societies think that ear wax is dirt and therefore, have different 'self-cleaning techniques that influence the use of cotton buds to remove ear wax. Therefore, there is need to adopt educational strategies to ensure that the public are exposed to information on different ways of self-cleaning the ear and most importantly are aware of risks associated with the use of foreign objects for cleaning ear wax.

The presence of immense evidence on the high prevalence of the use of ear buds in the world regardless of the risks that have been attached, indicate that it is a global issue. Kenya for example presents a great opportunity to conduct research on knowledge and then devise ways of increasing awareness.

As the review states the different effects of the use of ear buds to the ear, some effective and safer alternatives have been identified as well. Especially with the use of locally available material like sodium bicarbonate and olive oil that helps to dissolve the ear wax hence making its removal less intrusive. These alternatives suggest that people can be exposed to them and it would help reduce the negative effects of using ear buds and therefore improve the ear health outcomes.

The implications of this study are that the healthcare professionals can use the existing data and extrapolate to their local communities through educating patients about the risks of using the cotton buds and exposing them to alternative ways of self-cleaning. There could be policies that can be developed, especially, among marketers on the sale of ear buds and provide a regulation on manufacturing of the same. Through these studies, it can be easier to come up with educational campaigns to help deal with the misconceptions within the communities.

The production of cerumen is a common occurrence in human beings and regardless of the reasons that one decides to use self-cleaning mechanisms, ear wax will continuously be produced. Occurrences like excess ear wax is inevitable and the itching that is associated with it are the most constant in this situation. Therefore, alternate uses to ear buds have been discussed and easily accessible to people have been highlighted like the use of sodium bicarbonate, olive oil and over the counter cerumenolytics like water based ear drops. Increased awareness on the dangers of using cotton buds or other foreign objects have to be readily available for people. Some of the possible solutions to increasing awareness that have been suggested in the text include public education and utilizing the school health programmes, involving health professionals like primary care givers on the potential risks of using cotton buds for cleaning ears within the communities, community mindfulness talks using social media platforms and 'fortifying' the information and warnings given by the manufacturer at different educational levels.

CONCLUSION

The systematic review has highlighted the use of ear buds for ear cleaning in the different settings globally. It is clear that the concept of cleaning the ears is a general is conception of the importance of ear wax. Evidently, the associated health factors outweigh the benefits of removing was using the ear buds thereby validating the need for extensive public education campaigns to increase awareness of the risks and the knowledge on better ways of self-ear cleaning.

Some of the recommendations include having comprehensive educational campaigns to help educate the people. Since it is a cultural problem, it has been recommended that the ear health education could be incorporated into the school health curriculum to help alleviate a systemic problem of cultural misconceptions. The health care professionals have to be a part of the change and can be ambassadors of the information on proper ear health strategies for example having community health workshops. The health care professionals could help in developing and disseminating education materials like posters and marketing ad campaigns that are essential in increasing community awareness. Further, the health care providers should be trained fully on alternative ways of ear cleaning, which would then help them in easily recommending safer ear cleaning techniques to the people. It has also been recommended that the marketing campaigns are guided by the existence of policies and regulations on safe use and manufacture of ear cleaning materials, as well as incorporating health messages on the packaging materials of ear buds for safe use.

There is need for further research to be conducted especially with a focus on Kenya in finding out how education programs have become effective or not in eliciting behavioral change. More areas to consider is finding out the long term effect of changing into safer self-cleaning options. By adopting these recommendations there is hope that some change in behavior may happen and thus in the long run improve the ear health of people. It is clear that this is requires collective actions as a community and everyone must be in a position to effect the change.

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