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# Prevalence and associated symptoms of cerumen in adults in Rio Grande do Norte

## Prevalência e sintomas associados de cerume em adultos no Rio Grande do Norte

## Prevalencia y síntomas asociados de cerume en adultos en Rio Grande do Norte

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**Abstract**
*Objectives*: To evaluate the prevalence and associated symptoms of cerumen impaction in adults in the state of Rio Grande do Norte. *Methods*: This is an analytical, cross-sectional and observational research, with a quantitative approach, in which users, companions and employees of a tertiary hospital aged 18 years or older participated, through otoscopy and evaluation of clinical otological complaints. *Results*: 1,067 adults aged between 18 and 87 participated, 64.9% (n=692) were women and 35.1% (n=375) were men. Among them, 11.6% (n=124) had earwax impaction in one of the ears and 90.3% (n=963) had earwax in at least one ear. *Conclusion*: The prevalence of cerumen impaction in the study was significantly higher than in similar literature and it was shown to be an issue related to "using a flexible swab with cotton-tipped tips" and "having had previous ear washing". Otoscopy remains as the gold standard for the mostly asymptomatic clinic of patients with wax plugs.
**Keywords:** Cerumen; Otolaryngology; Cross-sectional studies.

**Resumo**
*Objetivos*: Avaliar a prevalência e os sintomas associados à compactação de cerúmen em adultos no estado do Rio Grande do Norte. *Métodos*: Trata-se de uma pesquisa analítica, transversal e observacional, com abordagem quantitativa, da qual participaram usuários, acompanhantes e funcionários de um hospital terciário com idade igual ou superior a 18 anos, por meio de otoscopia e avaliação de queixas clínicas otológicas. *Resultados*: participaram 1.067 adultos com idade entre 18 e 87 anos, 64,9% (n=692) eram mulheres e 35,1% (n=375) eram homens. Dentre eles, 11,6% (n=124) apresentavam cera impactada em uma das orelhas e 90,3% (n=963) apresentava cera em pelo menos uma orelha. *Conclusão*: A prevalência de impactação de cerúmen no estudo foi significativamente maior do que em literatura semelhante e mostrou ser um problema relacionado a "usar um cotonete flexível com pontas de algodão" e "ter lavado o ouvido anterior". A otoscopia permanece como o padrão-ouro para a clínica predominantemente assintomática de pacientes com tampões de cera.
**Palavras-chave:** Cerume; Otorrinolaringologia; Estudos transversais.

**Resumen**
Objetivos: Evaluar la prevalencia y los síntomas asociados a la impactación de cerumen en adultos en el estado de Rio Grande do Norte. Métodos: Se trata de una investigación analítica, transversal y observacional, con abordaje cuantitativo, en la que participaron usuarios, acompañantes y empleados de un hospital de tercer nivel con edad igual o superior a 18 años, mediante otoscopia y evaluación de síntomas clínicos otológicos. Resultados: Participaron 1.067 adultos con edades entre 18 y 87 años, el 64,9% (n=692) eran mujeres y el 35,1% (n=375) hombres. De ellos, el 11,6% (n=124) presentaba cerumen en uno de los oídos y el 90,3% (n=963) presentaba cerumen en al menos un oído. Conclusión: la prevalencia de la impactación de cerumen en el estudio fue significativamente mayor que en la literatura similar y se demostró que era un problema relacionado con "usar un hisopo flexible con puntas de algodón" y "haber tenido un lavado de oído previo". La otoscopia sigue siendo el estándar de oro para la clínica mayoritariamente asintomática de pacientes con tapones de cera.
**Palabras clave:** Cerumen; Otorrinolaringología; Estudios transversales.

## 1. Introduction

Glands of the outer two thirds of the ear canal produce substances that will form the cerumen (Shokry & Filho, 2017, Meyer *et al.*, 2020), which is a biological fluid rich in saturated and unsaturated fatty acids, long-chain hydrocarbons, cholesterol, alcohol, scalene, ceramides and triglycerides, in addition to exfoliated epithelial cells (Shokry & Filho, 2017, Zivic & King, 1993, Jabor & Amedee, 1997).

The presence of wax represents an important form of protection and natural lubrication of the ear canal, although its presence can be considered synonymous with poor hygiene, since its lipophilic character is mainly derived from sebaceous secretion (Shokry & Filho, 2017, Zivic & King, 1993). It also acts as an antibacterial agent by maintaining an acidic environment as well as an effective barrier against foreign substances such as water, insects and dust (Shokry & Filho, 2017, Meyers, 1977, Sevy *et al.*, 2022).

The cerumen is physiologically expelled by a self-cleaning mechanism aided by the jaw, in which it is directed to the ear, taking with it adhered dirt particles and hair strands (Meyer *et al.*, 2020, Gabriel, 2015). However, if this mechanism fails, earwax builds up and can even cause a total blockage of the ear canal. Such accumulation can impact the patient's life, leading him to seek medical attention, due to the development of symptoms, such as: ear-ache, hearing loss, tinnitus, fullness, itching, acute or chronic cough, odor and secretion (Schwartz, *et al.*, 2017).

The presence of cerumen is usually asymptomatic, but in symptomatic cases, its removal is indicated (Horton, *et al.*, 2020, Michels *et al.*, 2019). In addition, the need for an otological exam (otoscopy or complementary exam) for diagnosis would be another indication for a wax removal procedure (Demir *et al.*, 2019).

It is estimated that approximately 5% of healthy adults and up to 57% of elderly residents of long-term care homes, comprising 36% of patients with developmental delay in the United States, suffer from this condition (Mccarter *et al.*, 2007). Moreover, it is believed that excessive cerumen in high-risk groups, such as the elderly and patients with developmental delay, remains underdiagnosed and possibly undertreated, which certainly accentuates the percentage data cited above (Schwartz, *et al.*, 2017).

Therefore, seeking medical care due to associated symptoms constitutes one of the most common causes of discomfort reported in offices and emergencies, totaling approximately 12 million people in the United States seeking care annually in health services, and in almost 8 million cerumen removal procedures (Schwartz, *et al.*, 2017).

It is known that between 2% and 6% of the United Kingdom (UK) population suffers from cerumen impaction, making its removal the most common ear, nose and throat procedure performed in the UK primary care setting (Guest *et al.*, 2004).

In addition, people with communication issues, from intellectual deficits to children with speech delays, should be constantly examined in order to verify the presence of excess cerumen (Michaudet *et al.*, 2018). In view of the diagnosis and

knowledge of symptoms, it is essential to assess the prevalence of such comorbidities, in order to optimize care and improve the patient.

Although the literature addresses numerous articles describing the pathophysiology and clinic of earwax impaction, few address the epidemiology, especially in the Brazilian scientific spectrum. Therefore, the lack of studies on the subject highlights the need for its deepening, as well as the study and development of research on it and its biological impacts, either by the social understanding of this substance which is associated with poor hygiene, or by its physiological importance and its impacts when in disarray.

Thus, this study aims to evaluate the prevalence of ear cerumen in adults in the state of Rio Grande do Norte and the epidemiological distribution of this condition in the state, in addition to knowing and evaluating the symptoms of affected patients.

## 2. Methodology

This is a cross-sectional and observational study, which approached individuals aged 18 years or older (Pereira et al., 2018, Estrela, 2018). To calculate the sample size, all residents in the state of Rio Grande do Norte over 18 years of age (2,521,595 inhabitants by Instituto Brasileiro de Geografia e Estatística (IBGE) 2020) were used as a population parameter, a sampling error of 3% and a confidence interval were assigned. of 95%, which led to a size of 1067 volunteers, being collected from April 2021 to May 2022 in patients, companions and employees of a tertiary hospital covering the state.

As an inclusion criterion, it was necessary to find volunteers within the Hospital Universitário Onofre Lopes (HUOL), being in the outpatient clinics or in the wards, and as exclusion criteria, patients with agenesis of the auditory canal, surgical closure of the external auditory canal, presence of acute otitis (external or media) and chronic otitis media.

This research was approved by the Research Ethics Committee (CEP) of HUOL, CAAE 39732920.3.000.5292, presenting the Free and Informed Consent Term (ICF) before data collection. The propositions contained in Resolution 466/12 of the National Health Council were also used as a basis for the ethical aspects of research with humans.

Data collection was performed by medical students from the Federal University of Rio Grande do Norte in the 6th period of the course, who were previously calibrated up to a Kappa > 0.8, in relation to the Ear, nose and Throat (ENT) resident, to perform a specific physical examination of otoscopy. The examination sought to identify four parameters: absence of wax in the ear canal; the presence of wax in the conduit, that of obstruction less than 80% and the presence of "impacted wax", when the obstruction of the conduit exceeds 80% (Ping *et al.*, 2017).

It is worth noticing that all patients with an indication for wax cork removal were properly treated after their diagnosis. In addition, a social and clinical-epidemiological questionnaire was filled out and read and filled in by the evaluator.

Initially, a descriptive analysis was performed with data on mean and median age, proportion of each sex and prevalence of cerumen and total obstruction of the canal (wax plug). Then, the analysis of the statistical relationship was started using the Chi-Square test between all the clinical categorical variables and the physical examination, in search of any association. The findings found in the study were compared with those found in similar studies, always using a two-tailed p value of less than 0.05 as an indication of statistical significance.

## 3. Results

The study included a total of 1067 adults aged between 18 and 87 years, with a mean age of 49.39 years and a median of 50 years. Regarding gender, 692 female volunteers (64.9%) and 375 male volunteers (35.1%) participated. Of the total,

90.3% (n=963) had wax in one of the ears, as seen in Table 1, and 11.6% (n=124) had total obstruction of any one of the ears by wax (prevalence of wax), 4.59% (n=49) with total bilateral obstruction, about 39.52% of the total cases of total obstruction.

**Table 1 -** Data related to otoscopy.

| Physical exam | Frequency | Percentage |
|---|---|---|
| Presence of wax* | 963 | 90,3 % |
| Presence of wax on the right* | 929 | 87,1 % |
| Presence of wax on the left* | 915 | 85,8 % |
| Total obstruction*** | 124 | 11,6 % |
| Total obstruction on the right*** | 93 | 8,7 % |
| Total obstruction on the left*** | 81 | 7,6 % |
| Partial obstruction on the right** | 52 | 4,9 % |
| Partial obstruction on the left** | 53 | 5,0 % |

Note: *Presence of any wax residue; **Obstruction below 80%; *** Obstruction above 80%. Source: Produced by the authors**.**

Analyzing total obstruction according to sex, 57.3% (n=71) were female and 42.7% (n=53) were male, with a prevalence of wax plug in women of 10.3 % and 14.1% of men, the sex variable was not related to the wax stopper (p=0.590). When analyzing only individuals over 60 years of age, we obtained a prevalence of wax cork of 13.1% (35 of the 268 elderly individuals evaluated).

Regarding age, the mean for females was 48.14 years and for males 51.7 years, with a difference between the mean ages between the sexes (p<0.001). Among those who had or did not have a wax cork, the mean age was, respectively, 49.61 years and 49.36 years, demonstrating that there was no difference between the average ages of those who had or did not have a wax cork (p=0.856).

Dizziness was reported by 39.3% (n=419), as can be seen in Table 2, whereas among only those who had total obstruction in either ear, the percentage who reported feeling dizzy was 28.2% (n =35), thus being related to wax cork (p=0.007), showing a prevalence ratio of 0.608 (95% CI 0.420 – 0.882) with total obstruction.

**Table 2 -** Clinical data questioned during the interview.

| Clinical data | Occurrence | Absence |
|---|---|---|
| Right hypoacusis | 361 (33,8%) | 706 (66,2%) |
| Left hypoacusis | 385 (36,1%) | 682 (63,9%) |
| Dizziness | 419 (39,3%) | 648 (60,7%) |
| Right ear fullness | 318 (29,8%) | 749 (70,2%) |
| Left ear fullness | 320 (30,0%) | 747 (70,0%) |
| Right ear ache | 108 (10,1%) | 959 (89,9%) |
| Left ear ache | 117 (11,0%) | 950 (89,0%) |
| Right tinnitus | 399 (37,4%) | 668 (62,6%) |
| Left tinnitus | 395 (37,0%) | 672 (63,0%) |
| Itching in the right ear | 645 (60,4%) | 422 (39,6%) |
| Itching in the left ear | 655 (61,4%) | 412 (38,6%) |
| Sensation of something in the right ear | 208 (19,5%) | 859 (80,5%) |
| Sensation of something in the left ear | 226 (21,2%) | 841 (78,8%) |
| Use of flexible swab with cotton-coated tips * | 855 (80,1%) | 212 (19,9%) |
| Repeating AOM** | 197 (18,5%) | 870 (81,5%) |
| Frequent diving*** | 235 (22,0%) | 832 (78,0%) |
| Ear phone use**** | 315 (29,5%) | 752 (70,5%) |
| Previous ear wash | 271 (25,4%) | 796 (74,6%) |

Note: *Any use of flexible swab with cotton-coated tips **Acute Otitis Media; ***Frequency of twice a month; ****Any use; Source: Produced by the authors.

80.1% (n=855) reported using a flexible swab with cotton-coated tips, as well as 69.4% (n=86) of those who had a wax plug in one of the ears, as seen in Table 3. Thus, using a flexible nail was related to total obstruction (p=0.001), with a prevalence ratio of 0.561 (95% CI 0.395 – 0.797) with the formation of a wax plug (Table 4).

**Table 3 -** Evaluation of clinical data in patients with wax stopper.

| Clinical data | Occurrence | Absence |
|---|---|---|
| Right hypoacusis | 51 (41,1) | 73 (58,9) |
| Left hypoacusis | 44 (35,5) | 80 (64,5) |
| Dizziness | 35 (28,2) | 89 (71,8) |
| Right ear fullness | 51 (41,1) | 73 (58,9) |
| Left ear fullness | 37 (29,8) | 87 (70,2) |
| Right ear ache | 18 (14,5) | 106 (85,5) |
| Left ear ache | 12 (9,7) | 112 (90,3) |
| Right tinnitus | 55 (44,4) | 69 (55,6) |
| Left tinnitus | 44 (35,5) | 80 (64,5) |
| Right itching | 61 (49,2) | 63 (50,8) |
| Left itching | 59 (47,6) | 65 (52,4) |
| Sensation of something in the right ear | 21 (16,9) | 103 (83,1) |
| Sensation of something in the left ear | 26 (21,0) | 98 (79,0) |
| Use of flexible swab with cotton-coated tips | 86 (69,4) | 38 (30,6) |
| Repeating OAM | 19 (15,3) | 105 (84,7) |
| Frequent diving | 26 (21,0) | 98 (79,0) |
| Ear phone use | 40 (32,3) | 84 (67,7) |
| Previous ear wash | 47 (37,9) | 77 (62,1) |

Note: Values in parentheses represent the percentage. Source: Produced by the authors.

Another finding was the presence of recurrent Acute Otitis Media (AOM), reported by 18.5% (n=197) of the total and by 15.3% (n=19) of patients with wax plugs, with the variable to present “recurring AOM” unrelated to the impacted cerumen (p=0.338). In addition, 29.5% (n=315) of the volunteers stated that they used headphones, as of those who had total obstruction in one of the ears, the percentage was 32.3% (n=40), also without a statistical relationship (p =0.477).

**Table 4 -** p values and prevalence ratio of volunteers with wax stoppers.

| Clinical data | Frequency | P value* | Prevalence ratio** |
|---|---|---|---|
| Average age | | < 0,001 | - |
| Female | 48,14 | | |
| Male | 51,70 | | |
| Gender | | 0,059 | |
| Female | 71 (57,3) | | |
| Male | 53 (42,7) | | |
| Dizziness | | 0,007 | 0,608 (IC 95% 0,420-0,882) |
| Presence | 35 (28,2) | | |
| Absence | 89 (71,8) | | |
| Use of flexible swab with cotton-coated tips | | 0,001 | 0,561 (IC 95% 0,395-0,797) |
| Presence | 86 (69,4) | | |
| Absence | 38 (30,6) | | |
| Repeating OAM | | 0,338 | |
| Presence | 19 (15,3) | | |
| Absence | 105 (84,7) | | |
| Ear phone use | | 0,477 | |
| Presence | 40 (32,3) | | |
| Absence | 84 (67,7) | | |
| Left hypoacusis | | 0,364 | - |
| Presence | 44 (35,5) | | |
| Absence | 80 (64,5) | | |
| Right hypoacusis | | 0,008 | 1,682 (IC 95% 1,142 - 2,487) |
| Presence | 51 (41,1) | | |
| Absence | 73 (58,9) | | |
| Left ear fullness | | 0,350 | - |
| Presence | 37 (29,8) | | |
| Absence | 87 (70,2) | | |
| Right ear fullness | | <0,001 | 2,407 (IC 95% 1,638 - 3,536) |
| Presence | 51 (41,1) | | |
| Absence | 73 (58,9) | | |
| Left ear ache | | 0,679 | - |

| | | | |
|---|---|---|---|
| Presence | 12 (9,7) | | |
| Absence | 112 (90,3) | | |
| Right ear ache | | 0,018 | 1,845 (IC 95% 1,119 - 3,043) |
| Presence | 18(14,5) | | |
| Absence | 106 (85,5) | | |
| Left tinnitus | | 0,471 | - |
| Presence | 44 (35,5) | | |
| Absence | 80 (64,5) | | |
| Right tinnitus | | 0,022 | 1,570 (IC 95% 1,066 - 2,312) |
| Presence | 55 (44,4) | | |
| Absence | 69 (55,6) | | |
| Itching in the left ear | | 0,021 | 0,614 (IC 95% 0,404-0,932) |
| Presence | 59 (47,6) | | |
| Absence | 65 (52,4) | | |
| Itching in the right ear | | 0,041 | 0,668 (IC 95% 0,454 - 0,985) |
| Presence | 61 (49,2) | | |
| Absence | 63 (50,8) | | |
| Sensation of something in the left ear | | 0,951 | - |
| Presence | 26 (21,0) | | |
| Absence | 98 (79,0) | | |
| Sensation of something in the right ear | | 0,444 | - |
| Presence | 21 (16,9) | | |
| Absence | 103 (83,1) | | |
| Frequent diving | | 0,763 | - |
| Presence | 26 (21,0) | | |
| Absence | 98 (79,0) | | |
| Prior ear lavage | | 0,001 | 1,596 (IC 95% 1,239 - 2,054) |
| Presence | 47 (37,9) | | |
| Absence | 77 (62,1) | | |

*The p value was determined using the Chi-Square test. **The prevalence ratio was not obtained when there was no significance in the Chi-Square test. Source: Produced by the authors.

In addition, 22% (n=235) reported frequent diving activities, considering those with impacted cerumen 21% (n=26), also without association (p=0.763). Previous ear lavage was reported by 25.4% (n=271) of the study group, and by 37.9% (n=47) of the wax stopper group, with an association (p=0.001) with a prevalence of 1,596 (95% CI 1,239 - 2,054).

Finally, 21.2% (n=226) said they felt something in their left ear, whereas among all volunteers who had left ear obstruction, the percentage was 21% (n=26), which showed no association (p= 0.951). Similar to feeling something on the right side 19.5% (n=208), among those with total obstruction in the right ear the percentage was 16.9% (n=21) where there was also no association (p=0.444).

## 4. Discussion

According to the literature, the average prevalence of cerumen impaction was observed in the adult population in a range of 2 and 6%, estimating 2.3 million inhabitants with this alteration in the United Kingdom (Guest *et al.*, 2004). It is also worth noting that the prevalence of earwax impaction in healthy adults in the United States is 5% (Schwartz, *et al.*, 2017). In contrast, we found a prevalence of 11.6%, which is significantly higher.

The explanation may be related to the fact that these articles were published in the late 1990s and early 2000s, representing an interval of almost 30 years of epidemiological data, in addition to the fact that data from Brazilian studies or from developing countries were not found.

Factors such as the low availability of otoscopes and doctors trained to perform diagnosis and treatment in the primary care network make many patients in tertiary services present with a wax plug. However, as otoscopies were performed on companions and employees of the tertiary hospital, our series includes individuals who were not screened by primary care. Finally, bringing the world prevalence of type 2 diabetes (9.0% for men and 7.4% for women) in 2014 (NCD Risk Factor Collaboration, 2016) and Gastroesophageal Reflux Disease (15%) (Eusebi *et al.*, 2018) we noticed how impacted earwax is one of the most prevalent chronic diseases. Thus, we conclude the importance of developing primary care with technical and structural conditions for its management.

Most patients with the outcome did not present suggestive clinical signs even in the face of the possible clinical variable for the wax stopper, including symptoms such as sensation of something in the ear (absent in patients with stoppers in 83.1% on the left and 79% on the right) and otalgia (absent in those with cork in 89.9% on the left and 89% on the right). From this perspective, otoscopy remains the gold standard for its diagnosis, that is, it should be performed even in the absence of a suggestive clinic.

Another important finding was the use of a flexible rod of 0.561 (95% CI 0.395 – 0.797) related to the appearance of a wax plug. Despite not being a risk result, it shows an apparent reduction in the prevalence of wax cork in people who use the object, with 17.9% of those who do not use it and 10.1% of those who use the rods.

A reference study in the 2017 American impacted cerumen guideline (Schwartz, *et al.*, 2017), with a smaller sample size, carried out with 111 children seen for routine examinations, identified that among the 41 children who had canal impaction by wax, 37 children, the mothers explained to clean their ears with a flexible ear, finding an association between the variables, but without distinguishing whether the use would lead to a higher prevalence (Baxter, 1983).

Similar studies, such as those by Sim in 1988 (310 volunteers) (Sim, 1988) and Marcknin in 1994 (651 volunteers) (Macknin *et al.*, 1994), but with a smaller sample size, either failed to find an association between the stems and the wax stopper (Sim, 1988) or found an association only with the wax stopper. left side[18]. Thus, this study, in addition to presenting an expressive sample size, shows results that are little different from the available literature.

However, although there are conflicts between the literature, the causal relationship has not yet been established, as there is a lack of longitudinal studies on this topic. It is believed that the use of a flexible nail is not recommended, despite the

prevalence ratio demonstrating reduced cork formation, but because of its risk associated with trauma to the ear canal and external ear infections.

Regarding flexible nails, their frequency of use or their use limited to the pinna were not evaluated, which are the limitations of this study. In addition, as the study took place in a tertiary hospital, the risk of selection bias must be understood, which was attempted to be reduced when evaluating companions and employees.

Finally, as this was a cross-sectional study, there were no conditions to bring notions of causality to the study, hence the use of the prevalence ratio. We maintain the opinion of the importance of carrying out a longitudinal study to better assess such a prevalent topic, but which still presents conflicting evidence. Furthermore, the study differed in that it used only the adult population, while most studies evaluated the pediatric population more.

## 5. Conclusion

The prevalence of wax cork in adults is 11.6% (n=124), higher than the values described in the literature. No associations were found between the wax stopper and sex; recurrent acute otitis media; headset use; frequent dips and feeling like something is in the ear, while associations were found between the wax stopper and the use of a flexible swab.

In addition, most of the time, the wax plug was asymptomatic, which shows the need for otoscopy for its correct diagnosis. Finally, well-executed longitudinal studies are recommended as a way of complementing the results of the present study.

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