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## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/16354  
DOI URL: <http://dx.doi.org/10.21474/IJAR01/16354>



### RESEARCH ARTICLE

#### A META-ANALYSIS ON CORRELATION OF SITE AND SIZE OF TYMPANIC MEMBRANE PERFORATION WITH THE DEGREE OF HEARING LOSS

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#### Manuscript Info

##### Manuscript History

Received: 31 December 2022  
Final Accepted: 31 January 2023  
Published: February 2023

#### Abstract

A discharging ear is the most common presenting symptom for ENT conditions. However, some degree of hearing loss is always present. In order to compare the degree of hearing impairment with the size and location of the perforation, we made an effort to conduct this study. The purpose of the study is to ascertain whether, and if so, what, a relationship exists between the location and extent of the tympanic membrane perforation and the severity of hearing loss. In a systematic scoping review of randomized controlled trials, each database was subjected to a unique systematic search approach. Utilizing the methodological approaches specified in the Cochrane Handbook for Systematic Reviewers, a systematic scoping review is conducted after selection criteria, with results reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA). Tympanic membrane anomalies are the root cause of various degrees of conductive deafness. The size of the perforation affects how much hearing is lost. More of an impact is felt on lower frequencies than on higher frequencies. More deafness results from posterior-inferior perforations than anterior-inferior perforations.

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#### Introduction:-

After a middle ear infection, either acute or chronic, or after trauma, the tympanic membrane may perforate. Although the consequences of perforation on the middle ear mechanism are complex and not fully understood, we do know that isolated membrane perforations with intact ossicles can cause conductive hearing loss (CHL) of up to 50 dB. The amount of hearing loss depends on a number of parameters, including the size, location, and whether or not the hole touches the manubrium mallei. The size of the middle ear and the mastoid are further factors. Findings from a few prior studies indicate that large perforations that are posteriorly positioned and come into contact with the manubrium mallei increase the CHL level, particularly when they happen infrequently. The severity of the hearing loss also gets worse when the volume of the air cells in the middle ear and the mastoid bone declines [1].

#### Aim Of Study:-

The purpose of the study is to ascertain whether, and if so, what, a relationship exists between the site and extent of the tympanic membrane perforation and the degree of hearing impairment.

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**Methodology:-**

This systematic review was conducted using the methodological guidelines stated in the Cochrane Handbook for Systematic Reviewers [2], and it was reported using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) format. In order to define a research question, research strategy, research technique, and analytic plan, a panel of experts from various professions will be involved. The methodological foundation for the planned research project will typically be taken from the National Institute for Health Research's (NIHR) Service Delivery and Organization Research and Development Programme (SDO). The methodological framework initially specifies the operational definitions and conceptual boundaries of the issue area in order to establish a frame of reference. Without doing a systematic review, it then establishes a systematic overview (narrative review) of the literature.

**Search Strategy**

The search will be done using electronic databases like MEDLINE, EMBASE, CINAHL (EBSCO), AgeLine (EBSCO), PsycINFO (Ovid), and CENTRAL (Cochrane Library-Wiley) from the start to January 2021. Each database will have its own specific systematic search methods for finding pertinent citations to published trials.

**Study Selection**

Using defined and tested forms, the study will screen the citations, choose papers, and collect data from participating trials. Using a two-stage method, two review authors independently included trial papers that satisfy the inclusion criteria. The study will initially check the citations for eligibility based on the title and abstract. The full texts of pertinent citations will be checked twice, independently. Prior to the full-text screening, a pilot screening will be conducted. If disagreements occur, they will be settled through conversation and advice from a third review author.

**Eligibility Criteria****Inclusion Criteria**

1. Reviews that combine research findings addressing a clearly defined topic or research question using systematic, pre-planned techniques (which could comprise either quantitative, qualitative or mixed methodology)
2. Interventions offered in any format that are referred to as Motivational Interviewing (MI) or Motivational Enhancement Therapy (MET) (e.g., face to face, online, group, text or telephone)
3. English language
4. Interventions focused on adults.

**Exclusion Criteria**

Letters, commentaries, expert opinion, theoretical, and "non-systematic" or unstructured reviews, such as those without a purpose and reviews that did not explicitly specify the search technique, selection criteria, and quality evaluation used.

**Analysis**

The place and extent of the tympanic membrane perforation and the degree of the hearing impairment were examined utilizing various researches as part of a systematic review to see if there was any association. Based on peer-reviewed articles that were publicly accessible, this systematic review. As a result, it wasn't sent to an ethics committee for evaluation.

**Conclusion:-**

One of the essential functions of the human ear is hearing. The affected person's daily functioning and quality of life are negatively impacted by hearing loss. Conductive deafness is always the result of a malfunction in the transmission of sound waves up to the inner ear. Any pathology from the external ear all the way up to the oval window is likely to cause a conductive kind of hearing loss. Any disease that affects the brain auditory circuits and the cochlea is likely to cause sensorineural hearing loss. The degree of hearing loss is influenced by the size of the perforation. More of an impact is felt on lower frequencies than on higher frequencies. More deafness results from posterior-inferior perforations than anterior-inferior perforations.

YEAR	AUTHOR	SUMMARY
2009	Ibekwe et al [3]	In a study of 62 individuals, 15 (24.2%) had bilateral TM perforations, 21 (33.9%) right unilateral and 26 (41.9%) left unilateral ear drum perforations, with a mean age of 35.4 +/- 4 years and 77 perforations. For acute TM perforations, the correlation between the location of the perforations and the severity of the hearing loss was (P = 0.244, r = 0.273), and for chronic perforations, it was (p = 0.047 & r = 0.31).
2012	Bob Lerut et al [4]	A linear association between eardrum perforation size and hearing loss can be seen. When Umbo is involved, there is a 5–6 dB impairment of the hearing (p < 0.0001). At the resonance frequency of 2 kHz, a perforation has the least effect. The air-bone gap consistently exhibits a "inverted V shape" both above and below 2 kHz. It is necessary to presume and treat extra pathology behind the eardrum if the air-bone gap is greater than the "inverted V-shape" pattern.
2014	Nahata V [5]	Difference was noteworthy, with a P value of 0.000. The numerous perforation locations included Central (69 ears). Mean hearing loss was 35.64 decibels (dB) for the anterior (15 ears), 39.99 decibels (dB) for the posterior (16 ears), and 30.1 decibels (dB) for the anterior (15 ears). Difference was noteworthy, with a P value of 0.000. Higher frequencies were less impacted than lower ones. At 2000 Hz, an inverted "V" pattern of audiograms was seen
2017	Mohammed Radeef Dawood [6]	Preoperative mean ABG was inversely linked with the volume of the middle ear and mastoid (P=0.005) and increased with perforation size (P=0.018). However, there were no appreciable variations in mean ABG between perforations in anterior and posterior locations (P=0.924).
2017	David J. Carpenter [7]	For ears with large perforations, a direct association between MEV and CHL was seen across all frequencies, but this relationship for ears with tiny perforations was frequency-dependent
2019	Satish Kumar Bandaru et al [8]	With a p value of 0.002, the current study found a strong linear relationship between the severity of hearing loss and the amount of tympanic membrane perforation.
2021	Harshavardhan et al [9]	. On the PTA evaluation, we also noticed that patients with larger perforation had more hearing loss (P .0001). The centre region of 100 ears had the greatest perforations (70%) followed by the anterior superior (19%), anterior inferior (15%), anterior superior (9%), and anterior inferior (3%). Additionally, we noted that the median PTA frequency was substantially higher on the postero-superior site than on the anterosuperior, anterosuperior, and central sites (P 0.01).

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