



Fact or Myth: Pregnancy Affects Otosclerosis?

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Purpose

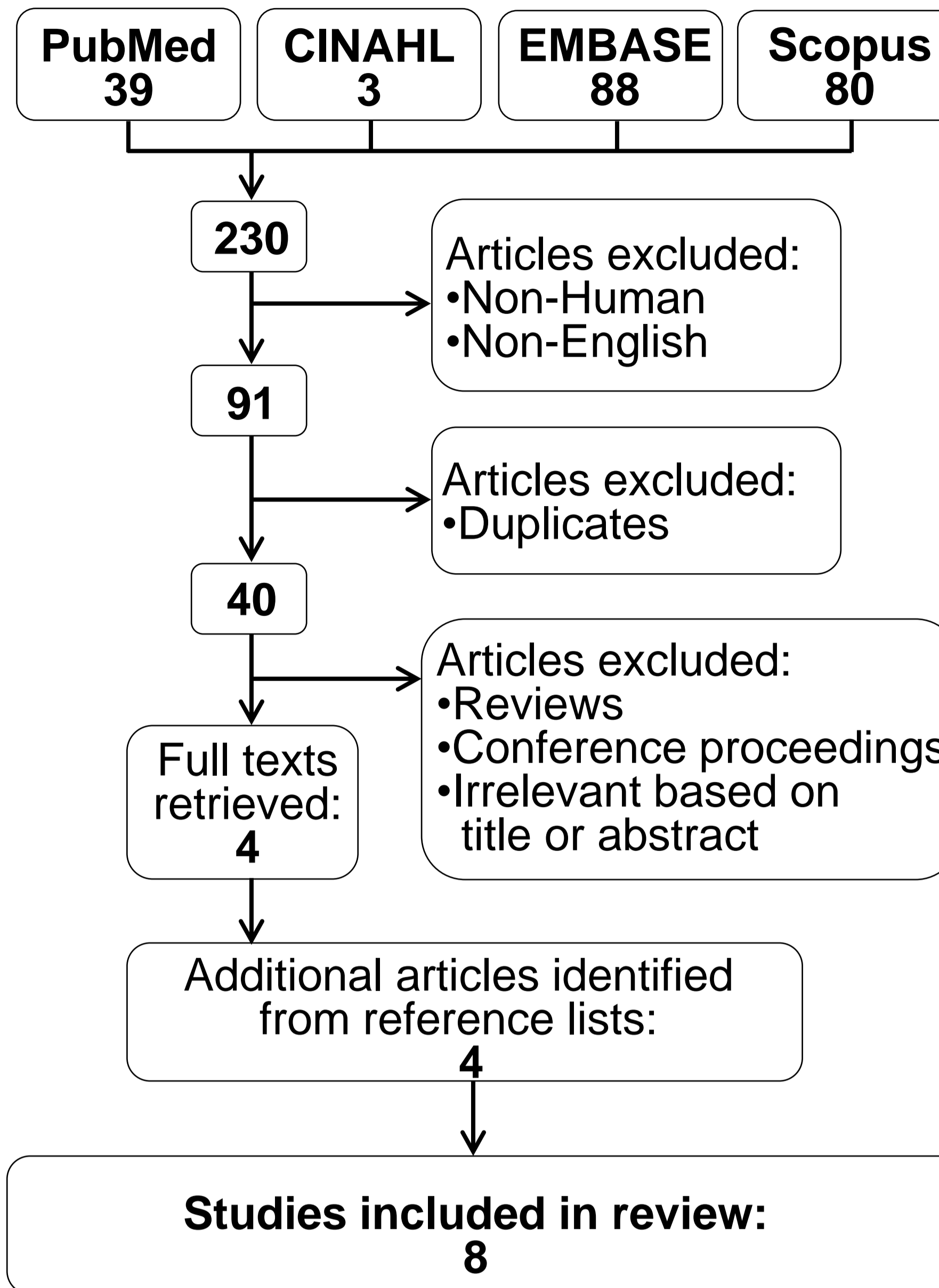
Clinical otosclerosis is present in about 1% of the population, and is twice as likely in women than in men. It commonly manifests in the 2nd and 3rd decades of life. There is a long-standing belief that hearing loss resulting from otosclerosis can worsen during pregnancy. Here, the existing empirical research is reviewed in order to answer the question: *Does pregnancy affect otosclerosis?*

Method

A systematic review of the existing literature was conducted. Searches were run in PubMed, CINAHL, EMBASE, and Scopus electronic databases between January 22nd and February 18th, 2015. Search terms were: 'otosclerosis', 'otospongiosis' and 'pregnancy'. Where available, these were searched as subject headings or MeSH terms in order to be as inclusive as possible. Supplementary searches of the reference lists of yielded studies.

Database	Search String	Results
PubMed	((("otosclerosis"[MeSH Terms] OR "otosclerosis"[All Fields]) OR "otospongiosis"[All Fields]) AND ("pregnancy"[MeSH Terms] OR "pregnancy"[All Fields]))	59
CINAHL	((("MH "Otosclerosis") OR "otosclerosis") OR ("otospongiosis")) AND (MH "Pregnancy")	3
EMBASE	((otosclerosis.mp. OR otosclerosis/) OR otospongiosis/) AND exp pregnancy/	88
Scopus	((TITLE-ABS-KEY (otosclerosis)) OR (TITLE-ABS-KEY (otospongiosis))) AND (TITLE-ABS-KEY (pregnancy))	80

Articles were appraised using the Crowe Critical Appraisal Tool (CCAT) Version 1.4. Papers were also given a level and grade based upon standards developed by Cox (2005). Briefly, levels 1-6 related to the type of evidence provided and grades A-D related to the relationship between the level of the study and the consistency of its conclusion.



Inclusion/Exclusion Criteria

Studies were included in this review if they contained original data on human participants and were accessible through Western Libraries in English. Accordingly, papers were excluded if they were duplicates, review papers, if they used non-human subjects, if they were not English, or if they were not accessible through Western Libraries. Conference abstracts or communications were also excluded.

Results

Summary information on each study included in this review is presented in the literature matrix below. Of the 8 papers retrieved, 5 imply or state outright that pregnancy negatively influences the hearing thresholds of women with otosclerosis in at least some cases. However, all five of these studies received poor Strength of Evidence and CCAT scores. Critically, most of these studies did not include appropriate control groups. The two papers that score ≥90% on the CCAT find no evidence that pregnancy has adverse effects on the progression of otosclerosis.

Conclusions

- The best evidence available on the effects of pregnancy on otosclerosis suggest that there is no decline in hearing ability resulting from pregnancy.
- While the two most recent studies are methodologically strong, there is still room for controversy in this question. Because only a subset of otosclerotic patients will experience disease progression over a period of time, comparing group data in a limited sample may wash out true effects experienced by this subset.
- The failure of many of the older studies to include appropriate control groups is a crucial flaw in the investigation of a disease that is known to progress at a variable rate over time and tends to manifest around the same time that women are typically experiencing pregnancy.
- Professionals can reassure their patients with otosclerosis that hearing loss is unlikely to be increased by pregnancy.

Year	Objective	Sample	Methodology	Results	Relevant Conclusions & Considerations	Level of Evidence	Strength of Evidence	CCAT score
2009	Analyze preoperative factors that contribute to stapedectomy outcome.	N=106 55 with children, 51 without (total sample 161)	Retrospective study assessed the effect of age, gender, unilateral vs. bilateral, right vs. left ear, pregnancy, vascular disease, family history, preoperative AC- and BC-PTA, SNHL and ABG on stapedectomy outcomes as measured by ABG, AC and BC -PTA, AB gain, SNHL, and change in SNHL. <i>Statistics:</i> paired t-tests, univariate and multivariate logistic regression.	The only factors affecting stapedectomy outcomes were age, AC-PTA, and pre-operative ABG. There was no difference in post-operative ABG, AC- or BC-PTA, SNHL, ABG gain or change in SNHL between groups that did versus did not have children. In fact, pre-operative BC-PTA and SNHL were significantly better in women with children.	The authors conclude that there is no deleterious effect of having experienced pregnancy pre-operatively on stapedectomy outcomes.	4	B	90% (36/40)
2005	Evaluate the effect of pregnancy on the hearing of women with otosclerosis.	N=94 47 with children, 47 without, age-matched	Retrospective study analyzed AC and BC thresholds and speech discrimination in quiet before and after stapedectomy. <i>Statistics:</i> paired t-tests and Pearson's correlation coefficients.	Mean AC and BC thresholds were not worse in women with children versus women without children. In fact, thresholds from 500 Hz through 4,000 Hz in women with children were slightly but significantly better than in women without children. No differences in speech discrimination. No correlation between hearing loss and number of children or time spent breastfeeding. No difference in the average age of stapedectomy. No increase in incidence of otosclerosis in women with children.	The authors find no adverse effect of having children on otosclerotic women. They admit that having pre-pregnancy audiometric data would be desirable, but conclude that it is not essential given that there was no difference between final outcomes in women who did or did not have children.	4	B	95% (38/40)
1983	Evaluate the effect of number of pregnancies on the hearing of women with otosclerosis.	N=479 with 0 to >9 children	Retrospective study of women's subjective report of hearing loss during or up to one year after pregnancy. Otosclerosis confirmed surgically. Severity of footplate fixation during stapedectomy was categorized and compared. <i>Statistics:</i> Pearson's chi-squared test.	33% of women report a pregnancy-related worsening of hearing after one pregnancy, while 63% report a worsening of hearing after 6 pregnancies. There were no differences in footplate fixation after the age of 20. Before 20, stapes fixation was negatively correlated with number of pregnancies.	The authors draw no strong conclusions about the effect of pregnancy on otosclerosis. They suggest that the negative correlation between footplate fixation and pregnancies is because women with early onset otosclerosis self-limit their pregnancies. This study had no control group; women who had had no pregnancies were not asked about their subjective experience of hearing loss. Inappropriate statistics.	4	D	53% (21/40)
1979	Study the influence of post-stapedectomy pregnancy on hearing thresholds.	N=144 34 with children, 110 without	Retrospective study of post-stapedectomy AC thresholds compared to follow up AC thresholds. In one cohort, women with children were followed up at 8.4 years as compared those without who were followed up at 5.8. In a second cohort, follow up was at 4.8 and 1.8 years respectively. <i>Statistics:</i> Student's t-tests, Wilcoxon's, Mann-Whitney's.	Greater hearing loss in the operated ear of the pregnancy group at 250 Hz and 1000 Hz in one group and 4000 Hz in the other. Significantly greater hearing loss in the un-operated ear of the pregnancy group at all frequencies.	Makes no conclusions. There is no mention of time of follow-up as a confound. Statistics were used to determine whether change in threshold differed from zero. If there was a significant difference from zero in only one group, a difference between groups was assumed.	4	D	33% (13/40)
1948	Investigate the effects of pregnancy on otosclerosis.	N=73 all with children	Retrospective study of hearing change resulting from pregnancy as measured by patient report. Otosclerosis confirmed with fenestration of the labyrinth. No statistical analysis.	37% of patients reported hearing loss initiated or increased by pregnancy, 45% reported no effect. Family history did not predict whether pregnancy aggravated hearing loss.	The author concludes that only a subpopulation of otosclerotic women experience worsening of hearing resulting from pregnancy. No control group.	4	D	68% (27/40)
1945	Investigate whether pregnancy results in hearing loss in patients with otosclerosis.	N=133 All with children	Retrospective study of women with presumed otosclerosis who had also experienced one or more pregnancies. Hearing compared before an after pregnancy, but no mention of how hearing was measured. Data could be based on patient report. No statistical analysis.	51 patients experienced hearing loss directly after or within six months of their first pregnancy. 22 patients experience hearing loss with subsequent pregnancies.	The author concludes that many otosclerotic patients are unfavorably affected by pregnancy, most often by a first pregnancy. No control group. Unclear data collection.	4	D	40% (16/40)
1941	Describe the presentation of otosclerosis in one pair of identical twins.	N=2	Case study. Describes birth of twins, health over their lifetimes, hearing status in both twins and pregnancy in one twin.	The twin who had a child also had higher AC thresholds at all tested frequencies.	The author concludes that pregnancy is the only known factor to account for the difference in hearing between the twins.	5	C	63% (25/40)
1939	Follow the progression of otosclerosis.	N=6 (total sample 62)	Case study. Otosclerosis diagnosed with audiometry and Rinne test. Audiograms pre- and post-pregnancy compared by eye.	Deafness did not obviously progress in any of the women following pregnancy.	The author concludes that there is insufficient evidence with which to draw conclusions.	5	C	70% (28/40)

ABBREVIATIONS: AB—air bone, ABG—air bone gap, AC—air conduction, BC—bone conduction, SNHL—sensorineural hearing loss, PTA—pure tone average

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