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Original Research Article

Does gestational diabetes mellitus affect the hearing of the baby?

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ABSTRACT

Background: Hearing screening results of babies born to mothers with and without gestational diabetes mellitus done within 24-48 hours of delivery using otoacoustic emissions was compared. Babies who failed the screening were recalled for further testing.
Methods: A prospective institutional based study was conducted between December 2018 and May 2020. All the babies were screened for hearing impairment using handheld OAE apparatus within 24-48 hours of delivery. History of gestational diabetes mellitus in the mother was enquired. Any baby with a "refer" result in the OAE study was recalled for a repeat OAE testing after a month. This was repeated two more times if the baby failed the test every time. In case of failing the test for the third time, the baby was sent for brainstem evoked response audiometry for confirmation of hearing loss.
Results: Screening was done for 14226 babies. Among them, 44 babies were born to mothers with gestational diabetes mellitus. The hearing screening results did not show a significant association between gestational diabetes mellitus and hearing impairment in the baby.
Conclusions: Gestational diabetes is considered as one of the risk factors for deafness in the baby. This study could not establish such a relationship.

Keywords: Gestational diabetes mellitus, Hearing screening, Otoacoustic emissions

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy.[1] Theoretically speaking, diabetes mellitus is a condition of insulin resistance with impairment of microcirculation with complications such as microangiopathy and neuropathy. Although such complications are more common in long standing cases of diabetes mellitus, ladies with pregestational poor glycaemic control may be diagnosed only during pregnancy and might be labelled as gestational diabetes mellitus. Since the inner ear is sensitive to ischemia, it is possible that diabetes mellitus in the mother can affect the hearing in the new-born.[2] Infants of diabetic mothers have been found to have higher malformation rates like caudal regression, situs inversus, duplex ureters, renal agenesis, cardiac anomalies, etc. [3]Gestational diabetes mellitus is a known risk factor for complications like polyhydromnios, hypoglycemia in the baby, seizures, electrolyte imbalance, NICU admission.[1] Its role in affecting hearing in the baby is yet to be established. Otoacoustic emissions result from the energy generated in the cochlea that are propagated through the middle ear and into the ear canal where they can be measured using a sensitive microphone.[4] Hence, it can be used as an effective screening tool to assess the effect of gestational diabetes mellitus on the hearing of the new-born.

Objectives

An objective of current investigation was to study the effect of gestational diabetes mellitus on the hearing of the new-born.

METHODS

The study was carried out between December 2018 and May 2020. It was a prospective institution-based study. All the babies born in the study period in the study institution Mcgann teaching district hospital, Shivamogga were screened for hearing loss. Out of these babies, only the babies born to mothers with gestational diabetes mellitus were taken as the sample size for this study. A total of 14226 babies were screened, of which 44 babies were born to mothers with gestational diabetes mellitus.

Inclusion criteria

All the babies born in the hospital during the study period were included in the study.

Exclusion criteria

Exclusion criteria for given study were; babies requiring urgent referral to higher centres, discharge against medical advice and death of baby before discharge from hospital.

Procedure

The babies left to be by the mother's side and were screened in the postnatal ward and babies referred to neonatal intensive care unit (NICU) were screened in the NICU. A soft probe tip of size enough to achieve seal was inserted into the external auditory canal of the baby and DPOAE (distortion product otoacoustic emission) was recorded for both ears separately. No further testing was done for babies with a "pass" result. The babies who failed the first screening were recalled for repeat OAE after one month and if they failed the test again, they were asked to come again after a month. In case of a "refer" result on the third time, such babies were referred for BERA. The details of all the babies were entered in Microsoft excel software and follow ups were updated accordingly. Details of the babies born to mothers with gestational diabetes mellitus were later collected from the previously entered data. To test the effect of gestational diabetes mellitus on the hearing of the new born, test of significance- Chi-square test was applied after creating a 2x2 table.

RESULTS

A total of 44 babies born to mothers with gestational diabetes mellitus were screened within 24-48 hours of birth. 6 babies had a "refer" result and were requested to come for a second OAE testing. In the second OAE, out of the 6 babies screened, only 1 baby failed the test and the rest 5 babies passed the test. Even this baby passed the OAE testing when tested for the third time. There were no babies born to mothers with gestational diabetes mellitus who required BERA testing.

Table 1: Results of first OAE.

GDM	Pass	Refer	Total
Yes	38	6	44
No	13031	1151	14182
Total	13069	1157	14226

On applying the Chi-square test, the result is insignificant with p value 0.181.

Table 2: Results of second OAE.

GDM	Pass	Refer	Total
Yes	5	1	6
No	989	162	1151
Total	994	163	1157

Chi-square test was applied to the statistical data and there was no significant difference observed between the outcomes in both groups.

Table 3: Results of third OAE.

GDM	Pass	Refer	Total
Yes	1	0	1
No	137	20	157
Total	138	20	158

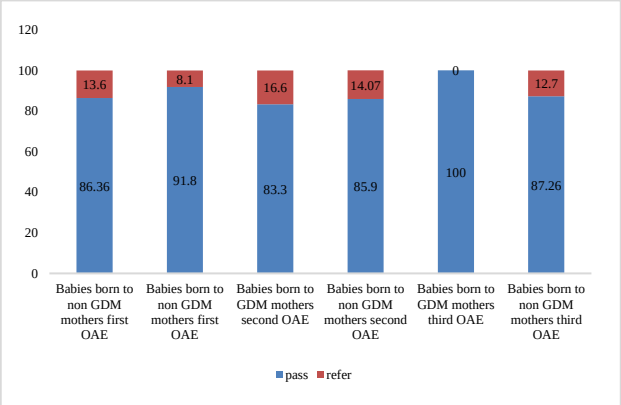

Figure 1: Hearing screening of babies born to GDM and non GDM mothers.

DISCUSSION

A total of 44 babies born to mothers with gestational diabetes mellitus were screened within 24-48 hours of birth. 6 babies had a "refer" result and were requested to come for a second OAE testing. In the second OAE, out of the 6 babies screened, only 1 baby failed the test and the rest 5 babies passed the test. Even this baby passed the OAE testing when tested for the third time. There were no babies born to mothers with gestational diabetes

mellitus who required BERA testing. A prospective study was done by Kountakis et al to identify potential risk factors for neonatal hearing loss. They concluded maternal diabetes as one of the potential risk factors for hearing impairment in the baby.[5] In a study by Jun-Hong Zhou et al, a significant difference was seen in the result of hearing screening between babies born to GDM and non GDM mothers. 69 GDM mothers were considered in the study and 597 non GDM mothers were considered. 7 babies of non GDM mothers and 3 babies of GDM mothers failed the screening. The chi square test showed a p value of <0.05. It was concluded that GDM increases the incidence of abnormal hearing in newborns.[6] In a study by Angeli C. Carlos-Hiceta et al it was found that the odds of having a 'refer' result in the initial hearing screening test (transient evoked otoacoustic emissions) of a baby born to a diabetic mother is 2x higher when compared with the results of a baby born to a non-diabetic mother.[7] But unlike our study, this study considered both gestational and pregestational diabetes mellitus. A retrospective study was conducted by Fatih Mehmet Hanege et al, comparing the otoacoustic emissions between infants born to healthy women and women with GDM. In the study, the study group consisted of 79 infants born to mothers with GDM and control group had 100 infants born to healthy mothers. There was no difference between the hearing screening results of the two groups.[8] In our study, similar to the above study, no significant difference in the results of two groups were observed (Figure 1). Hence, gestational diabetes mellitus could not be mentioned as an independent risk factor for hearing loss in the baby.

Limitations

A limitation of the current study was that study required multiple visits to the hospital.

CONCLUSION

Although diabetic microangiopathy is a possible risk factor for cochlear ischemia in the foetus and subsequent hearing loss, in practice it is less common because diabetic microangiopathy is a late complication of diabetes mellitus and gestational diabetes has a comparatively shorter history. Gestational diabetes can also predispose the mother for development of pre-eclampsia, which is another risk factor for hearing impairment in the baby.[1]This study aimed at assessing gestational diabetes as an independent risk factor for hearing loss in the baby and it was concluded that gestational diabetes does not affect the hearing in the baby. More studies need to be undertaken to authoritatively establish or dismiss the role of gestational diabetes in the hearing impairment of the new born.

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