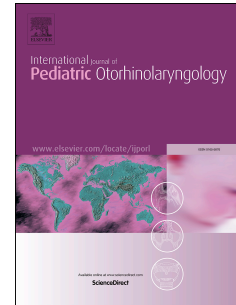


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Title: Follow-up in Newborn Hearing Screening – A Systematic Review

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Follow-up in Newborn Hearing Screening – A Systematic Review

Abstract

Introduction: The quality and efficiency of newborn hearing screening programs (NHS) rely heavily on appropriate follow-up. The Joint Committee on Infant Hearing recommends a follow-up rate of more than 95% of infants who fail the initial hearing screening. However, a 70% benchmark is considered to be more feasible. This high loss to follow-up (LTF) rate acts as a threat to the overall success of NHS programs. The objective of the study was to identify and examine the reported rates of LTF, attributed reasons for LTF and strategies undertaken to reduce LTF.

Methods: Using a systematic search, articles published between 2005 to December 2015 were identified from PubMed/Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Educational Resources Information Center (ERIC), Scopus, Ovid, ProQuest, and Cochrane Library. To be included in the review, the study should be exploring the loss to follow-up or drop-out rate in newborn hearing screening programs and be published in an indexed peer-reviewed journal in the English language. The main outcome measures were overall rate of LTF, factors leading to LTF and measures adopted to overcome LTF.

Results: 53 articles were short-listed for data extraction. Out of these, 27 were single-center studies, 19 were multi-center, 3 compared multiple databases, and 4 used survey-based methods. Overall LTF rates of 20% in single-centre and 21% in multiple-centre studies were observed. Educational disparity and lack of adequate knowledge among parents were associated with LTF. The most commonly used strategy to overcome LTF suggested by studies was the use of an adequate data management system.

Conclusion: This review is a novel attempt to explore the LTF among NHS studies, reasons for LTF and strategies to reduce LTF. This review can act as a basis for planning and execution of effective NHS programs.

Keywords: Newborn hearing screening, follow-up, loss to follow-up, reasons, strategies

Introduction

According to the estimates provided by the World Health Organization (WHO), approximately 7.5 million children in the world have a disabling hearing loss. At least 80% of these children live in low to middle-income countries [1,2]. In the absence of timely support and intervention, these children may experience lifelong difficulties in speech and language as well as complications in educational and vocational achievements [3-5].

Universal Newborn Hearing Screening (UNHS) has enabled early identification of infants with congenital or early onset hearing loss [6,7]. Multi-stage screening protocols incorporate tests such as Oto-Acoustic Emissions (OAE) and Auditory Brainstem Response (ABR). The quality and efficacy of the UNHS program rely heavily on overall coverage percentage, quality of testing and reporting, and timely referrals for diagnostic tests, interventions and follow-up [8]. Follow-up of infants who have failed hearing screening is essential in order to reap maximum benefits from the program. Timely follow-up promotes early access to comprehensive diagnostic services and management options for the infants detected with hearing loss and their families. The Joint Committee on Infant Hearing (JCIH) has recommended the 1-3-6 rule for monitoring follow-up [6]. Under this goal, newborn hearing screening should be completed before the infant turns one month of age, complete diagnosis of hearing loss by three months of age and the child with hearing loss should be enrolled for early intervention before six months of age.

The JCIH recommends a follow-up rate of more than 95% of infants who fail the initial hearing screening [9]. Prieve et al [10] have suggested a 70% benchmark to be more feasible. However, one of the major challenges of existing programs is the poor follow-up rate in infants who have failed the initial UNHS and have been referred for further testing (referred to as 'lost

to follow-up' or LTF) [11]. The issues related to LTF are present widely across programs, be it in the USA which has the most established UNHS programs or in low to middle-income countries which have recently commenced screening programs. In the USA, health care providers have frequently reported of poor compliance for follow-up testing of infants referred from screening [12,13]. Several contributors to LTF at each level have been identified which include: limited access to professionals, time constraints, and other co-morbid conditions [14-18]. Olusanya [19] reported issues related to LTF in low to middle-income countries to be commonly the result of logistic constraints, cost issues, poor infrastructure, and lack of appropriate patient data management and tracking systems.

The overall aims of the present systematic review were to identify and examine the reported rates of LTF, contributors to successful follow-up, attributed reasons for LTF, and strategies undertaken to reduce LTF.

Method

The review was carried out based on the guidelines of the Preferred Reporting Items for Systematic Review and Meta-analyses statement (PRISMA).

Eligibility criteria for type of studies and participants

The published literature was systematically searched based on a search strategy. The search was limited to English-language studies published during 2005 to December 2015. For the purpose of the present review, loss to follow-up (LTF) was defined as the percentage of infants that did not present for the second stage of newborn hearing screening after receiving a refer result in the initial screen. Only those studies reporting primary data based on a newborn hearing screening program were included. Studies that provided an overview or a review of more than one program

were excluded, as were opinion and commentary pieces. There was no criteria set for the study design in order to include a maximum number of studies. Studies carried out both in normal and high risk populations were included, as were those using targeted rather than universal screening.

Literature search

The literature search was carried out in February 2016. The search was completed using the following electronic databases: PubMed/Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Educational Resources Information Center (ERIC), Scopus, Ovid, ProQuest, and Cochrane Library. The keywords such as 'newborn hearing screening', 'universal newborn hearing screening', 'follow-up', 'oto-acoustic emission', 'auditory brainstem response' were used to develop search strings as per the requirements of the database using Boolean operators such as 'AND', 'OR' 'NOT'. The search string of the PubMed database has been attached as Appendix A.

Study selection

The search was carried out independently by two authors across all the electronic databases. The studies obtained were compiled together using a reference management system and the duplicates were eliminated. After removal of duplicates, the authors independently screened the titles. After title screening, the abstracts were screened by both the authors. Verbal discussion was used to solve any difference of judgements at any stage. The full-length text of the shortlisted abstracts was obtained for the data extraction procedure.

Data extraction and management

Data extraction was carried out using a specially pre-designed data extraction form. The form was developed following consultation among all the authors. The data was extracted on areas such as: purpose of the study, location of study, percentage of LTF, reasons for LTF, measures taken to resolve the LTF, key findings and future directions.

Methodological quality of included studies

A methodological quality appraisal tool was developed based on previous systematic reviews and standard guidelines [20,21]. Each single- and multi-centre study was rated for the questions on the tool and total percent scores were calculated. Based on the score obtained, each study was rated as follows: 0-33.9% as weak, 34-66.9% as moderate and 67-100% as strong. The tool was not applied to survey-based studies or multiple databases, being deemed inappropriate for such methods.

Analysis

Median and Inter-Quartile Range was used to report the LTF rate across studies. SPSS v. 16 was used for the purpose of data analysis.

Results

A total of 5145 hits were obtained on combining all of the databases of which 3293 duplicates were eliminated. The titles of the remaining 1852 articles were screened to exclude 1500 articles as they were not relevant to the review objectives. The remaining 352 abstracts were screened and 82 articles were included for next step. Full-text articles were retrieved for the 82 shortlisted abstracts. At each stage, agreement of >90% was noted between the two reviewers. Based on the full-text, 29 articles were eliminated as either there was no mention of LTF, they did not fulfill

the criteria, or they were in a language other than English. Finally, 53 articles were included for the data extraction process. Of the 53 studies, 27 were single-center studies, 19 were multi-center studies, 3 compared multiple databases, and 4 were based on survey-based methods. Based on the World Bank list of economies: 25 studies were from high income countries, 18 were from upper middle income countries, 8 were from low middle income countries, and 2 were from low income countries. Figure 1 shows the schematic representation of the systematic search process that was followed and Table 1 displays the study characteristics.

Among the included studies, the median and interquartile range (IQR) for the percentage of LTF for single center studies was 20 % (9 to 37.30%) and 21.99% (11.50 to 41.40%) for multi-center studies.

The methodological quality rating was carried out for single and multiple-centre studies. The tool used is shown in Table 2 and the rating for each study appears in Table 3.

Based on the percent score obtained, the study was classified as weak, moderate or strong. In the single-centre studies, 3 were classified as strong, 19 as moderate and the remaining 5 as weak. In the multiple-centre studies: 6 were classified as moderate, while 2 were classified as weak.

The review compiled the various reasons stated as contributors to LTF as shown in Table 4. The measures suggested for reducing LTF are shown in Table 5.

Discussion

The present systematic review was carried out to estimate the rate of loss to follow-up (LTF) in universal newborn hearing screening programs, to compile factors contributing to LTF and to

identify strategies that have been undertaken to reduce it. A comparison was made between single- and multi-centre follow-up studies.

Overall rate of LTF reported across the studies

A report presented by Center for Disease Prevention and Control [76] has suggested that nearly half of infants screened for hearing loss are LTF and/or have erroneous or incomplete documentation. These high LTF rates reduce the efficiency of early hearing detection and intervention programs. Sacket et al [77] have provided a rule of thumb that <5% LTF would lead to some bias and >20% would challenge the validity of the results. The findings of the present review shed light on the overall LTF rates of 20 % in single-centre studies and 21% in multi-centre studies carried out in the past 10 years. Accordingly, the LTF rates obtained in the present review are valid for single-centre studies and is slightly higher for multi-centre studies.

Factors contributing to successful follow-up across included studies

Single-centre studies

In single-centre studies, a multidisciplinary dedicated team of health care professionals reportedly formed the crux of successfully implemented UNHS and follow-up. This team was comprised of audiologists, physicians, nursing staffs, medical record staff, material management personnel, and midwives, along with the active support of parents. The health care professionals involved with UNHS must be well-educated and knowledgeable about risk factors for hearing loss, in addition to the importance and benefits of UNHS and early intervention services. They should also display good communication skills in order to explain the results to the parents of

newborns [24,26,31,34,38]. A systematic training of these professionals forms an important component of follow-up in UNHS programs [24].

The other factors reported to contribute to optimal follow-up rates included increased public and parental awareness and education [26,35,38]; a focus on risk factors, behavioral signs of hearing loss and normal language development [30]; regular and periodic awareness campaigns regarding the UNHS program [38]; and use of ABR following TEOAE testing to reduce overall expenses [23].

Multi-centre studies

The success of a multiple-centre studies was majorly attributed to increasing public awareness about the NHS program and its importance [57,59,65,67]. Reducing the distance of follow-up facility [52,55], stringent tracking system [59,63] and multi-disciplinary team [52,57] were the other important components of multiple center NHS programs. Farid et al [57] suggested that the team should optimally be comprised of an obstetrician, pediatrician and audiologist. Additional reported factors that contributed to successful follow-up related to family support, telemedicine services [65]; insurance types, early initiation of follow-up before 3 months of age [55]; maternal education, high family income [52]; emotional and economic support [63] and improved health-care facilities [59].

In database and survey-based studies

In studies based on compilation of databases, two reasons were predominantly attributed to better follow-up rates. These included the importance of documentation of follow-up [69,70]; and motivation and commitment from the involved professionals [68,70]. This draws attention to the

need to have accurate documentation of follow-up and a dedicated team for a successfully implemented NHS program.

Four studies used survey methods to compile data on follow-up rates in NHS. The different methods used included: telephonic interview of parents [71], web-based survey tool [72], and interviews of centers following NHS through telephone [73] or post [74]. A close co-operation between parents, midwives, pediatricians, ENT doctors, as well as the cost carriers such as insurance companies and Government aid played a vital role in enhancing follow-up rates [74]. The other reported contributing factors included maintaining a comprehensive demographic database [72] and legislation mandating UNHS [71].

Factors contributing to LTF

It is important to identify the factors that contribute to LTF in UNHS. This can help to form new regulations, bring improvement and changes in the existing health policies which in turn can lead to an effective UNHS program [59]. Twenty-five out of 53 studies discussed the factors believed to have influenced the LTF rate. The most commonly reported factor was educational disparity or lack of adequate knowledge among parents which was reported by nine (36%) studies. Studies have indicated that this inadequate knowledge leads to default in uptake of other early intervention services as well [13,14]. The next factor was distance, reported by seven (28%) studies. Five studies (20%) reported difficulties due to work constraints and unfavorable attitude of parents as being significant factors (Table 4).

Measures adopted to overcome LTF

The review also compiled the measures undertaken to increase follow-up in UNHS programs which were discussed in 22 out of 53 studies (Table 5). The most commonly reported strategy

was the use of an adequate data management system [5 out of 22 studies (23%)], such as HiTrack NCHAM database management system or other electronic databases. Data management and tracking systems also offer useful storage of patient data which can be used to test the efficacy of the screening program [6,53]. Four studies (18%) suggested the need for increasing parental education as a major measure. Specifically, providing written screening results to parents [4], increasing communication between the parents and medical professionals [5], and distributing educational materials to increase knowledge were recommended [33].

Limitations and future directions

The present systematic review was limited only to studies published in the English language and in the last 10 years and the results showed that the majority of papers concerned high income countries. It also did not include non-published literature such as dissertations and theses as well as studies from non-indexed journals that might exist on this subject. It was difficult to estimate the overall LTF for studies on multiple databases and surveys, as a wide percentage range was reported. This review points out the need to have higher quality studies with well-defined inclusion-exclusion criteria, strong methodological bases and experimental/quasi-experimental study designs. There is also a certain need to have exact and standard definitions of common terminologies and protocols associated with UNHS programs across the different countries. This will enable improved generalizability of the study findings.

Conclusion

The present systematic review has been a novel attempt at exploring the LTF rates for UNHS programs. The included studies were either single-centre, multi-centre, survey or database studies. The overall LTF rate of 20% in single centre studies and 21% in multi-centre studies was

noted. The most commonly used or suggested measures leading to increased follow-up across the studies included the need of a multidisciplinary dedicated team, a focus on public awareness, and the need for better documentation and database systems. This review also helped to identify several factors attributed to LTF, the most common being lack of knowledge and larger commuter distances. The results obtained from the present review may assist in planning and implementation of improved UNHS programs.

Table 1 Characteristics of studies included in the systematic review

Study ID	Place, Country	Study design	Income Group*	% of loss to follow-up	
SINGLE CENTRE/HOSPITAL					
1	Khairi et al ²²	Malaysia	Prospective	UMI	29.03
2	Lin et al ²³	Taipei, Taiwan	-	HI	24.74
3	Abdullah et al ²⁴	Malaysia	-	UMI	26.70
4	Korres et al ²⁵	Greece	-	HI	58.20
5	Mukari et al ²⁶	Malaysia	-	UMI	40.65
6	Mathur & Dhawan ²⁷	New Delhi, India	-	LMI	20.00
7	Swanepoel et al ²⁸	South Africa	Retrospective	UMI	68.00
8	Baflar & Guven ²⁹	Turkey	-	UMI	81.25
9	Benito-Orejas et al ³⁰	Spain	-	HI	3.60
10	Khaimook et al ³¹	Thailand	Prospective	UMI	0.64
11	Korres et al ³²	Greece	-	HI	65.50
12	Olusanya et al ³³	Lagos, Nigeria	Cross-sectional	LMI	12.84
13	Ohl et al ³⁴	France	-	HI	19.70
14	Olusanya ³⁵	Nigeria	Cross-sectional	LMI	10.20
15	Geal Dor et al ³⁶	Jerusalem, Israel	-	HI	17.73
16	Guastini et al ³⁷	Italy	-	HI	9.80
17	Ahmad et al ³⁸	Malaysia	Retrospective	UMI	37.30
18	Coenraad et al ³⁹	Netherlands	Retrospective	HI	7.80
19	Kim et al ⁴⁰	Korea	Retrospective	LI	18.00
20	Paladini et al ⁴¹	Italy	-	HI	0.31
21	Sennaroglu et al ⁴²	Turkey	-	HI	6.20
22	Tungvachirakul et al ⁴³	Thailand	Prospective	UMI	23.20
23	Lim et al ⁴⁴	Seoul, Korea	Retrospective	LI	20.09
24	Arslan et al ⁴⁵	Turkey	Prospective	HI	0.64
25	Augustine et al ⁴⁶	India	Descriptive	LMI	17.38
26	Jewel et al ⁴⁷	Ludhiana, India	Prospective	LMI	30.00

27	Qi et al ⁴⁸	Beijing, China	-	UMI	43.13
MULTIPLE CENTRE /HOSPITAL					
28	Swanepoel et al ⁴⁹	South Africa	-	UMI	60.00
29	Calevo et al ⁵⁰	Italy	Prospective observational	HI	11.50
30	Szyffer et al ⁵¹	Poland	-	HI	37.30
31	Griz et al ⁵²	Brazil	-	UMI	14.30
32	Olusanya et al ⁵³	Lagos, Nigeria	-	LMI	52.60
33	Olusanya et al ⁵⁴	Lagos, Nigeria	Cross-sectional	LMI	51.60
34	Spivak et al ⁵⁵	New York, USA	Retrospective	HI	8.70
35	Fan et al ⁵⁶	Taiwan	-	HI	5.70
36	Farid et al ⁵⁷	Egypt	Matched Case control	LMI	41.40
37	Paul ⁵⁸	Cochin, India	-	LMI	6.28
38	Cavalcanti et al ⁵⁹	Brazil	Cross-sectional	UMI	38.80
39	Friderichs et al ⁶⁰	South Africa	-	UMI	21.99
40	Zhang et al ⁶¹	Gansu, China	-	UMI	19.87
41	Barker et al ⁶²	Australia	-	HI	19.10
42	Huang et al ⁶³	Taipei, China	Cohort	HI	5.60
43	Pisacene et al ⁶⁴	Italy	-	HI	25.00
44	Bush et al ⁶⁵	Kentucky, USA	Retrospective	HI	19.00
45	Firoozbakht et al ⁶⁶	Iran	Cross-sectional	UMI	30.00
46	Scheepers et al ⁶⁷	Western Cape Province, South Africa	Retrospective	UMI	54.05
MULTIPLE DATABASES					
47	Liu et al ⁶⁸	Massachusetts, USA	Retrospective	HI	5.93
48	Alam et al ⁶⁹	USA	Online Survey	HI	35.00
49	Vos et al ⁷⁰	Belgium	Descriptive & Retrospective	HI	37.79
SURVEY BASED					
50	Lieu et al ⁷¹	USA	Telephonic Interview	HI	15-29
51	Gaffney et al ⁷²	Georgia, USA	Web-based survey	HI	>30.00
52	Meyer et al ⁷³	South Africa	Survey design	UMI	21-69% for 44% programs, >70% for 28% programs
53	Metzger et al ⁷⁴	Switzerland	Retrospective consecutive cohort	HI	13.00

* The classification of income group of countries is based on the World Bank classification of economies given in July 2016 ⁷⁵

Abbreviations used

HI: High Income

UMI: Upper middle Income
LMI: Lower Middle Income
LI: Low Income

Table 2

Methodological quality appraisal tool

-
- Q 1 Was the research question/objective clearly stated?
- Q 2 Was the study population clearly specified and defined?
- Q 3 Were the inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all study participants?
- Q4 Was a sample size justification provided?
- Q5 Was loss to follow-up after baseline testing (screening stage 1) 20% or less?
- Q6 Was a pass/refer criteria clearly specified?
-

Table 3

Methodological quality appraisal scores obtained for each study

Study ID	Q1	Q2	Q3	Q4	Q5	Q6	% score*
Single-centre/hospital							
1 Khairi et al [22]	1	1	1	1	0	1	83.33
2 Lin et al [23]	1	1	0	0	0	1	50.00
3 Abdullah et al [24]	1	1	0	0	0	0	33.33
4 Korres et al [25]	1	1	0	0	0	1	50.00
5 Mukari et al [26]	1	1	0	0	0	0	33.33
6 Mathur & Dhawan [27]	1	1	0	0	1	1	66.67
7 Swanepoel et al [28]	1	1	0	0	0	1	50.00
8 Baflar & Guven [29]	1	1	0	0	0	0	33.33
9 Benito-Orejas et al [30]	1	1	0	0	1	1	66.67
10 Khaimook et al [31]	1	1	0	0	1	0	50.00
11 Korres et al [32]	1	1	0	0	0	1	50.00
12 Olusanya et al [33]	1	1	0	0	1	1	66.67
13 Ohl et al [34]	1	1	0	0	1	0	50.00
14 Olusanya [35]	1	1	0	0	1	0	50.00
15 Geal Dor et al [36]	1	1	0	0	1	1	66.67
16 Guastini et al [37]	1	1	0	0	1	1	66.67
17 Ahmad et al [38]	1	1	0	0	0	0	33.33
18 Coenraad et al [39]	1	1	1	0	1	1	83.33
19 Kim et al [40]	1	1	0	0	1	1	66.67
20 Paladini et al [41]	1	1	0	0	1	0	50.00
21 Sennaroglu et al [42]	1	1	0	0	1	0	50.00
22 Tungvachirakul et al [43]	1	1	0	0	0	0	33.33
23 Lim et al [44]	1	1	1	0	1	1	83.33
24 Arslan et al [45]	1	1	0	0	1	1	66.67
25 Augustine et al [46]	1	1	0	0	1	1	66.67
26 Jewel et al [47]	1	1	0	0	0	1	50.00
27 Qi et al [48]	1	1	0	0	0	1	50.00
Multiple-centres/hospitals							
28 Swanepoel et al [49]	1	1	0	0	0	1	50.00
29 Calevo et al [50]	1	1	0	0	1	1	66.67
30 Szyffer et al [51]	1	1	0	0	0	0	33.33
31 Griz et al [52]	1	1	0	0	1	1	66.67
32 Olusanya et al [53]	1	1	1	0	0	0	50.00
33 Olusanya et al [54]	1	1	0	0	0	0	33.33
34 Spivak et al [55]	1	1	0	0	1	0	50.00
35 Fan et al [56]	1	1	0	0	1	0	50.00
36 Farid et al [57]	1	1	0	0	0	0	33.33
37 Paul [58]	1	0	0	0	1	0	33.33
38 Cavalcanti et al [59]	1	1	1	0	0	0	50.00
39 Friderichs et al [60]	1	1	1	0	0	1	66.67

40	Zhang et al [61]	1	1	0	0	1	0	50.00
41	Barker et al [62]	1	0	0	0	1	1	50.00
42	Huang et al [63]	1	1	0	0	1	1	66.67
43	Pisacene et al [64]	1	1	0	0	0	0	33.33
44	Bush et al [65]	1	1	1	0	1	0	66.67
45	Firoozbakht et al [66]	1	1	1	0	0	0	50.00
46	Scheepers et al [67]	1	1	0	0	0	1	50.00

*total score divided by total number of items in the tool multiplied by 100.

Table 4

Contributing factors leading to LTF

Sr. no	Factors for Loss to follow-up
1	Educational disparities and lack of knowledge among parents [24,25,28,34,35,52,65,67,74]
2	Distance [26,30,33,48,52,54,62]
3	Work constraints [24,26,33,35,54]
4	Unfavorable attitudes [25,49,62,67,73]
5	Less priority given to hearing compared to other medical conditions by parents [40,62,71,73]
6	Rescreened at some other center [34,40,48]
7	Inaccurate contact details [35,54,72]
8	Change of Address [33,54,68]
9	Superstitious and cultural beliefs [24, 49,54]
10	Barriers to adequate healthcare [65,71,74]
11	Financial constraints [28, 52, 65]
12	Lack of health insurance [55,65,67]
13	Forgot to keep an appointment [26, 33, 67]
14	Lack of scheduling a follow-up appointment [25, 26, 62]
15	Lack of understanding of results [30, 50]
16	Parental refusal [26, 68]
17	Lack of service provider's knowledge [62, 74]
18	Overburdened nursing staff used as a screener [60]
19	Lack of family support [54]
20	Lack of service system capacity [74]
21	Communication failure, socio-economic barriers, lack of parental reminders [71]
22	Incomplete test reports [69]
23	Short time to implement NHS [49]
24	Early discharge [34]
25	Screening staff on leave [24]
26	Reduced maternal education [52]
27	Anxiety [73]

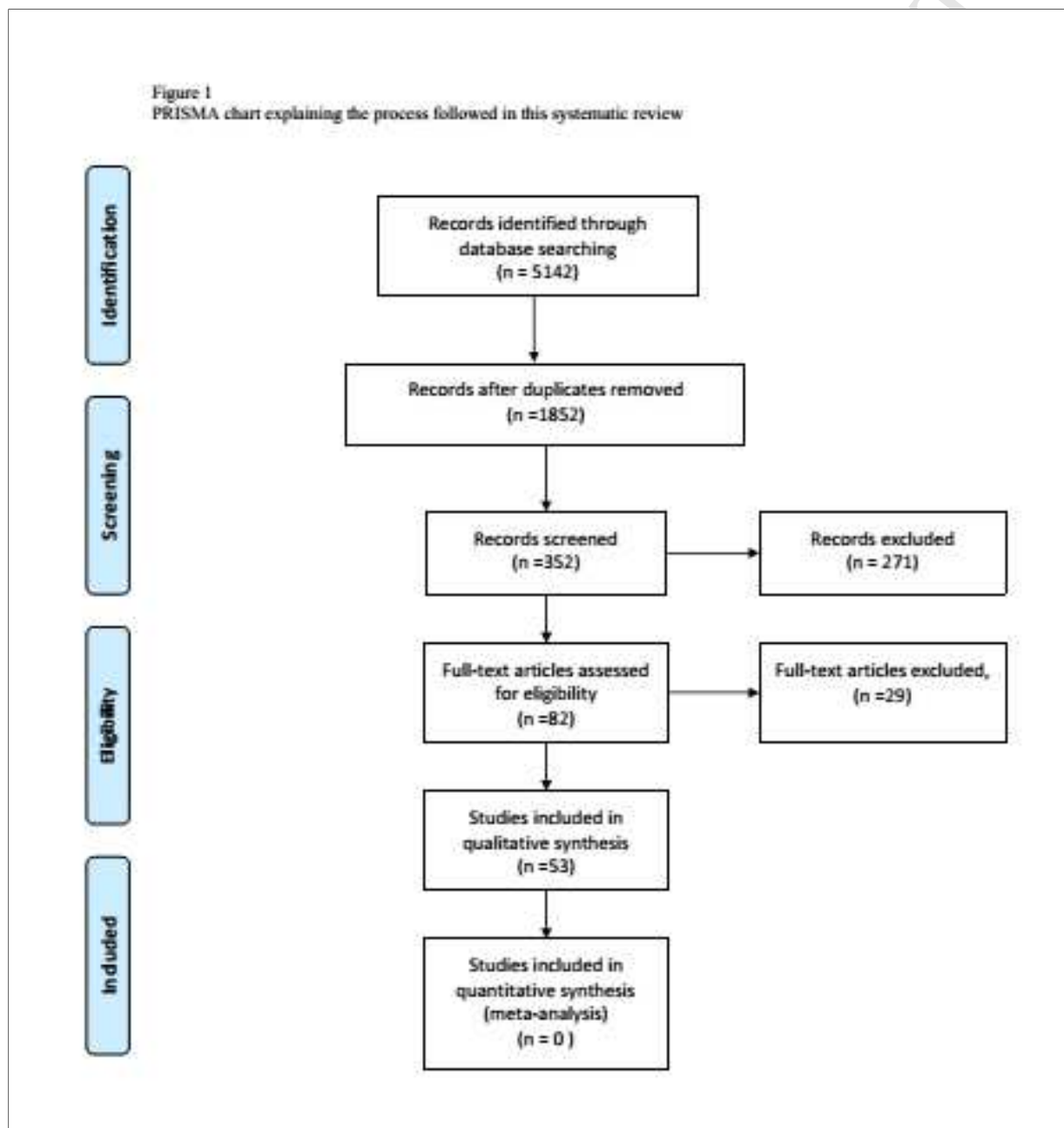
Table 5

Measures suggested to reduce LTF

Sr. No	Measures to increase follow-up
1	Database management system [28, 38, 60, 63, 64]
2	Increased parental education [25, 26, 40, 54]
3	Telephone reminders [24, 35, 46, 60]
4	Multidisciplinary team [33, 50, 71]
5	Flexibility in scheduling appointments [26, 48]
6	Visual reminders and written reports [60, 71]
7	Financial support [63, 64]
8	Handouts to parents [24, 71]
9	Psychological support [50, 63]
10	Counselling [25, 46]
11	Centralized screening facility [58]
12	Scheduling at the time of immunization [47]
13	Minimizing repeat visits [54]
14	Verbal reminders [23]
15	Text message/letters/reminders (single or in combination) [73]
16	Reminders by community health care workers through home visits [60]
17	Knowledge of local language and culture by screening personnel [60]
18	Collaboration of state programs [68]
19	Increasing knowledge of medical staff [40]
20	Hearing screening reports sent to primary care physicians [71]
21	Free screening and follow-up testing [33]
22	Increasing knowledge of prospective mothers that hearing screening is of no harm [33]
23	Scheduling follow-up testing at one week rather than six weeks [46]
24	Common birthing package in private hospitals [28]
25	Maintaining first screening book [38]
26	Communicating hearing test results [25]

Figure 1

PRISMA chart explaining the process followed in this systematic review



Appendix- A

Search string for PubMed

(((((((((newborn) OR infant*) OR neonate*) OR pediatric) OR paediatric) OR child*)) AND
((((((((hearing screening) OR audiological screening) OR ABR) OR auditory brainstem
response*) OR BERA) OR brainstem evoked response audiometry) OR AABR) OR
automated auditory brainstem evoked response*) OR automated auditory brainstem
evoked potential*)) AND (((follow-up) OR follow-up rate) OR rate of follow-up) OR
loss to follow-up)) NOT heart

Filters used: published in the last 10 years, Humans, English, Infant: birth-23 months.

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