



Determining the factors causing delayed referral for fetal echocardiography at a tertiary care hospital

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Objective: To determine the factors causing delayed referral for fetal echocardiography at a tertiary care hospital.

Background: Timely referral for fetal echocardiogram is considered essential for identification of congenital heart diseases, interventions, and counseling of parents. The present study highlights the factors associated with delayed referral for fetal echocardiography.

Material and methods: This prospective study includes a total of 200 pregnant females who were referred for fetal echocardiography. The data collected included referral indications, gestational age, maternal age, educational status, referral personale, and final diagnosis on echocardiography.

Results: The mean gestational age of presentation was found to be 33 weeks [standard deviation (SD), 4.8 weeks]. Among 200 females, 24% were referred at second trimester, 69% presented at third trimester, and 6% of the females presented at term. No female presented before 18 weeks of gestation. Our results showed that most of the females (94%) were referred by their gynecologist. Eighty-nine percent of the females were booked since the first trimester. The most common indication for referral was unexplained death of children (60%). Of 200 pregnant women, 40% were found to be illiterate and 60% were educated. However, the mean gestational age of presentation of illiterate females was 32.9 weeks (SD, 4.2 weeks), and for educated women it was 33 weeks (SD, 5 weeks). Congenital heart disease was diagnosed in 12% of the cases.

Conclusion: On the basis of the results, it could be concluded that delayed presentation for fetal echocardiography was not associated with the educational status of females. By contrast, referral personnel were found to be responsible for the delayed referral of females. Therefore, we strongly recommend that both pregnant women and gynecologists be educated about the importance of timely diagnosis for identification of congenital heart diseases.

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Introduction

Fetal echocardiography is an imaging technique used for the diagnosis of fetal cardiac anomalies. It provides quality images and detailed anatomy of the fetal heart. Commonly, fetal echocardiography is performed between 18 weeks and 22 weeks gestational age [1]. Congenital heart diseases (CHDs) are the most frequent form of birth defects with an incidence of 5–8 individuals per 1000 live births. Fetal echocardiography is considered essential for identification of CHDs, timely interventions, and counseling of parents [2]. Precise diagnosis of fetal heart defects offers several benefits including improvement in outcomes among critical neonatal lesions [3,4].

Referral indications for fetal echocardiography include varying maternal and fetal factors for CHD. Nevertheless, the majority of cases are not associated with previously known risk factors. Indications of fetal echo primarily included parents with history of CHD, parents with a previous child with CHD, an anomaly scan with suspicion of CHD, fetal arrhythmia, extracardiac anomalies, chromosomal anomalies, presence of polyhydramnios or oligohydramnios, maternal diabetes, and history of maternal exposure to certain toxic medications [5,6]. Among these, chromosomal anomalies and suspicious obstetrical scan are considered high yield indications, whereas family history of CHD and teratogen exposure are low yield indications [7].

Prenatal diagnosis of CHD has a profound impact on prenatal and postnatal management and related outcomes, so timely referral is very important. Despite its various advantages, fetal echocardiography has several technical limitations which include maternal obesity, fetal position, and late gestation. These parameters restrict appropriate cardiac evaluation owing to acoustic shadowing especially during late gestation [8]. In developed countries, there is no evidence of late presentation for fetal echo. However, in our study population, there is a growing body of evidence of late presentation of pregnant females for fetal echocardiography. The reason for this delay has not been documented in any previous study. Therefore, this study was designed to investigate the factors responsible for delayed presentation of patients for fetal echocardiography. The outcomes of the present finding could be very useful for health professionals and related authorities to formulate countermeasures to prevent this delay.

Abbreviations

| | |
|------|------------------------------------|
| CHD | Congenital heart diseases |
| RIC | Rawalpindi Institute of Cardiology |
| SD | Standard deviation |
| Echo | Echocardiography |

Material and methods

This descriptive observational study was conducted in the Department of Pediatric Cardiology, Rawalpindi Institute of Cardiology, Rawalpindi, Pakistan, over a period of 1 year (January 2016 to December 2016). This public sector, tertiary care cardiac center caters to patients from Punjab and the northern areas of Pakistan. The institutional review board of the hospital approved the study protocol. All pregnant females referred for fetal echocardiography were evaluated for inclusion in the study. After obtaining consent from the pregnant females, evaluation was performed.

We prospectively recruited pregnant women referred for fetal echocardiography to participate in our study. The data collected included referral indications, gestational age, maternal age, educational status, referral personale, and final diagnosis on echocardiography.

Various referral indications included maternal CHD, family history of CHD, maternal diabetes, obstetrical scan suspicious for CHD, fetal arrhythmia, maternal cardiac disease, extracardiac congenital anomalies, and chromosomal anomaly [6].

Gestational age was expressed in weeks. The first trimester was considered to last until the completion of 14 weeks. The second trimester lasted from the 15th week to the 28th completed week and the third trimester lasted from the 29th week to the 42nd completed week [9].

Educational status was classified as follows: illiterate (no education), primary (5 years of schooling), secondary (8 years of schooling), graduate (14 years of education), and postgraduate (16 years of education). The females who were not illiterate were considered as educated.

An illiterate was described as someone who cannot understand, read, and write a short simple statement of their own in everyday life [10].

All echocardiographies were performed by the consultant pediatric cardiologist. In this study, two-dimensional echocardiography, M mode echocardiography, color doppler, and pulsed doppler echocardiography were used. We evaluated cardiac position, situs, four-chamber view, five-chamber view, short axis, ventricular out flow

tract, aortic arch, rate, and rhythm. All females were informed to perform echocardiography of the baby after birth.

Statistical analysis

Data were entered and analyzed in SPSS version 19, IBM Corporation, USA. Frequency was calculated for qualitative variables, including educational status, indications for referral, referral personale, and diagnosis. Mean and standard deviation (SD) were calculated for quantitative variables such as maternal age and gestational age.

Results

Among 200 pregnant females, the mean age of presentation was 28 years and the mean gestational age of presentation was 33 weeks (SD, 4.8 weeks). Among all females, 48 (24%) presented during the second trimester and 138 (69%) presented in the third trimester (Figure 1) There were 12 females (6%) who presented at term, just a few days prior to delivery. No female presented before 18 weeks.

Our results showed that most of the females (188; 94%) were referred for fetal echocardiography by the gynecologist, eight (4%) were referred by the radiologist after an anomaly scan, and four (2%) were referred by their cardiologist (Figure 2). There was no self-referral. Of the total (200), 89% were booked with the gynecologist since the first trimester, 9% were booked in the second trimester, and 2% in the third trimester (Figure 3).

The most common indication for referral was unexplained death of a previous child seen in 124 cases (62%). The second common reason of referral was history of CHD in previous children, found in 34 cases (17%), followed by extracardiac anomalies on detailed anomaly scan (9%), mother

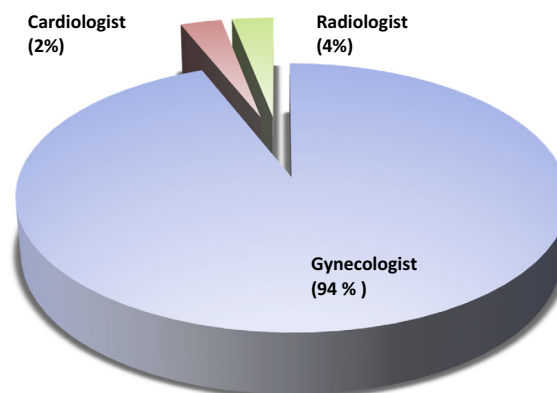


Figure 2. Percentage of pregnant females referred by different referral personnel.

with CHD (5%), history of abortions (5%), maternal systemic diseases such as maternal diabetes (4%), and fetal arrhythmias (2%) (Figure 4). Overall, 40% of the females were found to be illiterate, whereas the remaining 60% attained varying levels of education, ranging from primary to post-graduate education. Meanwhile, the mean gestational age of presentation for illiterate females was 32.9 weeks (SD, 4.2 weeks), and for others it was 33 weeks (SD, 5 weeks) (Figures 4 and 5). CHD was diagnosed in 24 (12%) of the cases, with Ventricular Septal Defect being the most common defect seen in 10 cases.

Discussion

Over the past two decades, imaging technology for the assessment of fetal heart and cardiovascular system has developed significantly. Early diagnosis of congenital heart defects has various repercussions that likely result in providing thorough counseling to parents about fetal health, strategy for postnatal treatment, prognosis, reproductive counseling, and review of recurrent risks

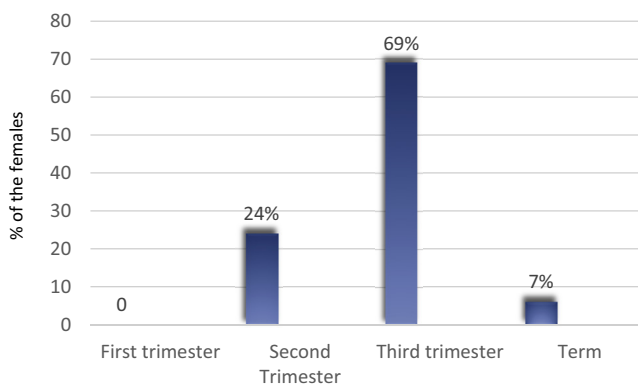


Figure 1. Presentation of pregnant females for fetal echocardiography during different trimesters.

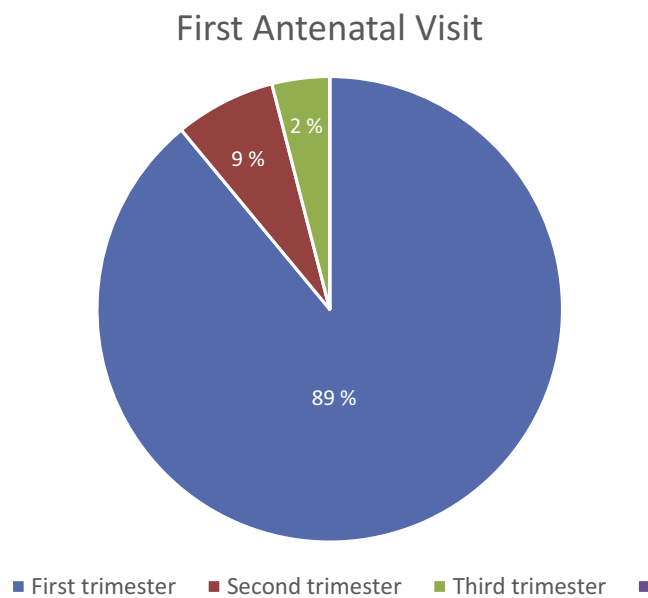


Figure 3. Percentage of females booked with the gynecologist for antenatal care during different trimesters.

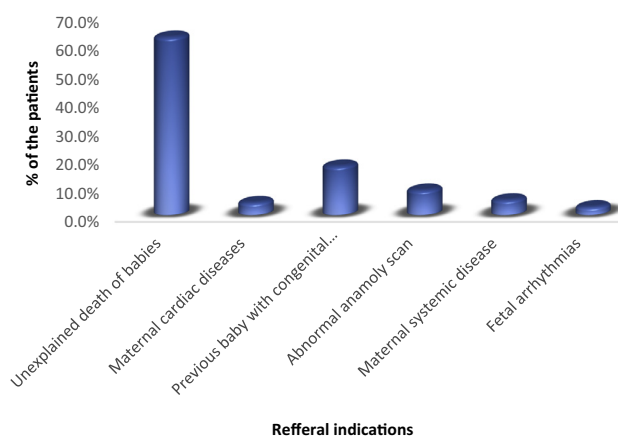


Figure 4. Referral indications.

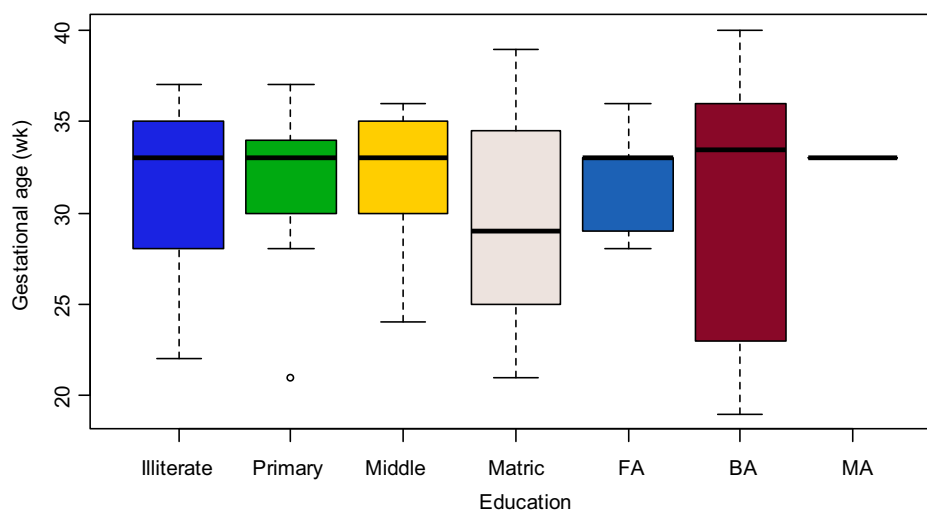


Figure 5. Level of education and mean gestational age at presentation for fetal echocardiography.

for future pregnancies [11]. Specificity and sensitivity of fetal echocardiography for the diagnosis of fetal heart defects were reported as 98% and 42%, respectively. The positive predictive value was found to be 90% and the negative predictive value was 93%. When fetal echocardiography is considered necessary, it should be performed during the second trimester [12].

Antenatal detection of CHD is now considered to be the required standard of care in developed countries in order to improve the final outcome. In developing countries such as Pakistan, the diagnostic and intervention facilities for congenital heart defects are very limited. Most of the females are unaware of the importance of fetal echocardiography, and they present late.

The current study was designed to investigate the factors causing delayed presentation for fetal echocardiography in our study population. Two hundred pregnant female were included in this study. Our results indicated that the mean gestational age of presentation was 33 weeks. It has been reported that early cardiac imaging, preferably between the first or early second trimester, is likely to provide a reasonable understanding of the fetal heart with a success rate of above 90% for visualizing the four-chamber and proximal outflow tracts in major referral centers. The ideal time appeared to be during the 13th to 14th weeks of gestation [13–15]. However, Becker and Wegner [16] reported fetal echo between 11 weeks and 13 weeks. Pike et al [17] found that the mean gestational age at presentation was between 18 weeks and 22 weeks. In contrast with the aforementioned studies, our study showed that most of the females presented at 33 weeks. The fact that most of these females (94%) were referred by their gynecologist indicates that these patients had no issue regarding their access to medical facilities. Of that total, 89% were in regular follow-up with their gynecologist from the first trimester, showing that the delay was mainly attributable to the gynecologist. Most of the females had bad obstetric history and previous unexplained deaths of children—thus, their families including their spouses wished to receive proper medical advice in order to save the pregnancies. There were no self-referrals, suggesting that the general population lacks awareness regarding the importance of fetal detection of and intervention in cardiac diseases. Intriguingly, similar results were found for illiterate and educated females. The mean gestational age of presentation of illiterate females was 32.9 weeks, and for educated women it was 33 weeks. These finding indicated that the delayed

presentation for fetal echo was not associated with the educational status of the mothers. The reason for this delay was probably lack of awareness regardless of educational status. It was also realized that the delay was likely to be associated with the gynecologists in most of the cases. Surprisingly, the determinant factor for this behavior remained unclear.

Our study showed that the most common indication of referral was unexplained deaths of previous children (62%) followed by history of CHD in previous children (17%). In addition, 9% of referrals were attributed to extracardiac anomalies on detailed anomaly scan, followed by mother with CHD (5%), history of abortions (5%), and fetal arrhythmias (2%). The study of Callan et al [18] has suggested that family history of CHD was the most common indication for referral followed by fetal dysrhythmia. However, another study reported that the most common indication for fetal echo was abnormal cardiac view on anomaly scan (which occurred in 50% of their cases), followed by fetal hydrops (30.8%), and polyhydramnios (25%). Moreover, a low percentage of referrals were associated with chromosomal defects and extracardiac anomalies [18]. Contrary to the aforementioned studies, Nair and Radhakrishnan [19] described echogenic cardiac foci as the most prevalent indication of referral. In our study, CHD was found in 24 (12%) cases. However, Pike et al [17] and Nair and Radhakrishnan [19] reported a comparatively higher percentage of fetal cardiac anomalies, i.e., 22.5% and 19%, respectively [18,19].

Conclusion

Prenatal diagnosis of fetal CHD has been an important aspect of fetal management and related outcomes. The results of the present investigation suggested that gynecologists should be more aware about the importance and consequences of timely referral of pregnant females for fetal echocardiography. The general population must have awareness regarding the importance of prenatal diagnosis and management of cardiac anomalies for improved outcome. In conclusion, these findings will be helpful for specialists to devise effective guidelines for referral of fetal echocardiography to improve the detection rate and timely interventions of CHDs in Pakistan.

Conflict of interest

None to declare.

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