

# Evaluation of Normal Heart Rate in Early Pregnancy Corresponding to Gestational Age between Six to Eight Weeks

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## ABSTRACT

**Background:** Ultrasonography is the reliable and safe way for the evaluation of pregnancy. Heart rate can be detected more confidently from the Ultrasonography. Heart rate is an important parameter for the evaluation of early pregnancy. The purpose of this study was to evaluate the normal heart rate in embryos/fetuses between 6 and 8 weeks of gestation.

**Method:** In our region people are poor and most of them do not know the benefit of regular follow up examination during pregnancy. So most of pregnant women come to our centre at late stage of pregnancy. The number of pregnancy cases is good in our centre but the number of early pregnancy cases coming to regular follow up examination is low. Thus the study was conducted in 51 normal singleton pregnancies undergoing routine ultrasound examination during the first trimester of pregnancy. The duration of study was 6 weeks.

**Result:** Out of 51 singleton pregnancies, 20 cases (39.2%) heart rate were between 131-150 beat per minute and 25 cases (49.0 %) heart rate were between 151-170 beat per minute. However 4 cases (7.8%) were between 110-120 beat per minute and 2 cases (3.9%) were more than 171 beat per minute. There were zero cases above the 180 beat per minute.

**Conclusion:** The result of this study will help to evaluate abnormal and normal fetal heart rate so that early clinical decision whether to continue the pregnancy or terminate it can be taken, as

Ultrasonography is only the method used in screening fetal well being in most of the region of our country.

**Keywords:** Beat per minute, Heart rate, Fetal, M-mode, Singleton pregnancies, Ultrasonography

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## INTRODUCTION

In developing countries like Nepal the cause of early fetal demise or abnormal pregnancies are common. So early detection of probable abnormal pregnancies is very challenging. For early detection of abnormal pregnancy is difficult in our region as most of the patient still come to visit hospital/ medical advice at late stage of pregnancy. Out of the different investigations Ultrasonography is mostly used and reliable investigation in our region. That's why we are using Ultrasonography as our study method to evaluate normal fetal heart rate so it would help clinician to evaluate abnormal pregnancy in our region.

Ultrasonography plays a vital role in differentiating normal and abnormal pregnancies in early pregnancies.<sup>1</sup> Normal heart rate between 6-8 weeks is related with fetal outcome<sup>2</sup> and is not often studied in our region. Reliable and reproducible information concerning embryonic/fetal heart rate may be obtained from a single measurement, especially when pregnancies are examined before 10 weeks of gestation.<sup>3</sup>

Different studies found that abnormal heart rate are one of the important parameter to predict fetal outcome such as miscarriage.<sup>4</sup> Some studies also found out that fetal heart rate are very important parameter in screening congenital abnormalities of fetuses for example; tachycardia in trisomy 21 and bradycardia in trisomy 18.<sup>5</sup> Therefore assessment of fetal heart rate in early pregnancy is effective tool for clinical decision-making.<sup>6</sup> The fetal heart rate in early pregnancies gradually increases until a stable normal heart rate is reached.<sup>7</sup> Even ultrasound proven viability of early pregnancy, monitoring heart rate can also predict the outcome of fetus. Gradually decreasing fetal heart rate is another predictor of spontaneous abortion.<sup>8</sup> similarly bradycardia in first trimester serves as a sign for impending fetal loss.<sup>9</sup>

A cross section study was performed of 51 singleton pregnancies undergoing routine ultrasound examination during the first trimester of pregnancy. For each case, the fetal heart rate was measured on one occasion as there is less variation in heart rate in this group (<10 weeks).<sup>3</sup> The aim of the present study was to measure the normal heart rate in early pregnancy in our country so that abnormal heart rate can be detected earlier and helps in early clinical decision making.

### MATERIALS AND METHODS

Cross-sectional study was performed in first trimester (6-8 weeks) of 51 low risk pregnancies. Single measurement of the fetal heart rate was performed during routine first-trimester trans-abdominal Ultrasonography. Fetal crown-rump length was the method of dating the gestational age. A duplex color Doppler machine with simultaneous B-mode and M-mode capabilities (Toshiba nemio XG machine) and a 7.5-MHz trans-abdominal (curvilinear) probe were used. The heart rate was determined from M-mode tracings using electronic calipers (figure 2). The heart rate was calculated by measuring the time interval of two cardiac cycles, using clearly identified elevation in the M-mode tracing. Tracings were obtained at the clear m-mode tracing with suspended respiration of mother in each examination. The exact recording time interval was provided by the glossy prints. Heart rate measurements were calculated and

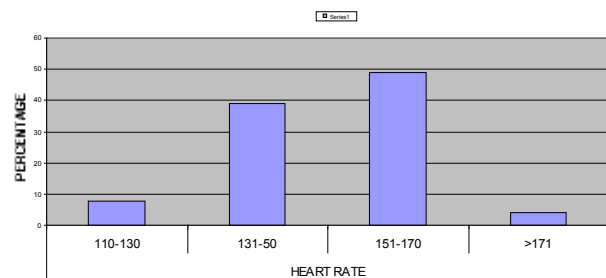
was considered for analysis. No follow up scan was done. The normal heart rate of fetuses in first trimester (6-8 weeks) was considered between 110-180 bpm (14).

**Table 1: Fetal Heart Rate**

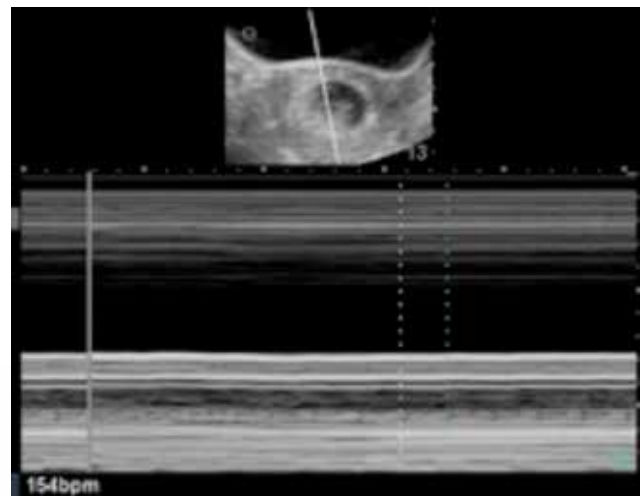
Range of heart rate in beat per minute	Number of cases Total no = 51
110-130	2
131-150	20
151-170	25
> 171	4

### RESULTS

The median fetal heart rates varied from 110 to 180 beats/min between 6 and 8 week's gestation. Out of 51 singleton pregnancies, 20 cases (39.2%) heart rate were between 131-160 beat per minute, 25 cases (49.0 %) heart rate were between 151-170 heart rate. However 4 cases (7.8%) were between 110-130 beat per minute and 2 cases (3.9%) were more than 171 beat per minute. There were zero cases above the 180 beat per minute (Table 1).



**Figure 1 : The bar diagram represent percentages of cases in X axis and ranges of heart rate of fetuses in Y axis.**



**Figure 2 : Example of M-mode done while measuring heart rate of 8 weeks gestation.**

## DISCUSSION

This study indicates that reliable and reproducible information concerning the fetal heart rate, during the first trimester of pregnancy, can be obtained from a single measurement. Those early pregnancy with heart rate up to 110 beat/min are lower range of normal fetal heart rate and above the heart rate up to 180 beat/min are higher range of normal fetal heart rate in this age group (14). However heart rate below 110 beat/min and above 180 beat/min are abnormal heart rate in this age group (i.e. 6-8 weeks of gestation).

Similar study done by Doubilet PM and Benson CB on embryonic heart rate in the early first trimester: what is normal? Showed that lower limit of normal heart rate in early pregnancy is 100 beat/min. However they have not mentioned about the higher range of heart rate.<sup>2</sup>

N Montenegro, et al. study on Variation of embryonic/fetal heart rate at 6-13 week's gestation found that there is less variation in fetal heart rate in lower gestation (<10 weeks) than more than 10 weeks of gestation. They did not provide normal range of heart rate.<sup>3</sup>

Shenker L, et al. carried out a study on Embryonic heart rates before the seventh week of pregnancy which showed an increase in the rates between the 7<sup>th</sup> and 9<sup>th</sup> gestational weeks; the rates gradually declined thereafter until the 15<sup>th</sup> week. This study does not explain about the normal heart rate of embryo instead it explains the change in pattern of heart rate with gestational age.<sup>10</sup>

In 1990, Rampen A published data on diagnosis of viability in early pregnancy with vaginal sonography. He found that the heart rate (mean +/- SD) increased from 110 +/- 8 beats per minute at 5 weeks menstrual age to 170 +/- 6 beat/minute at 9 weeks and declined thereafter to 159 +/- 3 beat/min at 13 weeks. Our study is via trans-abdominal approach so we could not assess heart rate in less than 6 week of gestational age. However he also included other parameters which we have not included.<sup>11</sup>

Similar but prospective study done by Stefos, et al. explained that a heart rate between 116 and 125 beats/min was associated with the fewest losses in the age group between 42-45 days and in 46-49 days of gestations.<sup>12</sup> However fewest losses of fetuses in age group between 50-52 days and 53-56 days were related with heart beat of 146 beats/min. Heart rates below 85 beats/min in age group of 6-8 weeks did not survive.<sup>13,14</sup>

## CONCLUSION

Nepal is a developing country where health care system is not adequate, mostly in rural areas. Health care system even gets worse as most of the populations are below poverty line who can not afford expensive investigations. In those regions of Nepal Ultrasonography is used as an only screening way of early fetal well being. So my study is hoped to benefit all populations but mostly focuses on these areas.

In terai region of our country, my study shows that fetal heart rate between 110 to 180 beat per minute is normal heart rate in 6-8 weeks of early pregnancy.

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