INTRODUCTION
1.1 Introduction

Our Planet Earth is the only planet till date that harbors living creatures varying from single cell to multi-cell, multi-organ, multi-system complex organisms like human beings. They can multiply, procreate and produce similar organisms like themselves with similar genetic configuration or of different makeup. If theory of evolution is true then during evolution, some of creatures evolved to the high level of intelligence, language skills, thinking, cognitive functions, fine arts and music due to the development and evolution of brain. Man is the only animal having all these functions. The time taken for this evolution and transformation is supposed to be millions of years.

In human beings brain is important because it imparts unique features to the human beings. The brain begins its development at conception and there is rapid growth and development of brain up to about one year after birth. Disorders like Autism,\textsuperscript{1,2} schizophrenia,\textsuperscript{3} behavioral changes and various types of epilepsies are found to have reduced brain volumes. It is reasonable to hypothesize that normal brains have evolved on natural selection for increased intelligence and normal mental function.\textsuperscript{4} Similar to the adult brain volumes, fetal brain volumes may be having correlation with numerous disorders occurring in the adulthood. This correlation could only be established when estimation of the normal fetal brain volumes in that particular population is standardized.

Sonography means visualization of the body structures like the internal organs and assessment of pregnancy & fetus by the use of ultrasound with a frequency of 2 MHz to 12 MHz or even more. Because of the advent of sonography, human fetus no longer develops unseen, and may be photographed in utero. With the aid of ultrasound, a woman can view the fetus within her body. She can watch fetus move before she is able to feel the fetal movements. Fetuses are also the subjects of medical scrutiny and intervention. They can be examined for genetic defects as well as become patients for corrective surgeries. At the same time fetus is also subjected to agonizing decisions whether to terminate pregnancy. Quite simply, our relations with human fetus have multiplied, heightening need for surer foundations to guide those relations.
Currently, parameters like the bi-parietal diameter and head circumference are used much more commonly for estimation of gestational age than for the assessment of growth of fetal brain. However, the measurement of fetal brain volume would be well correlated with the growth of brain in fetus. Measurement of the volume always is superior to the linear measurement, as human beings themselves are three dimensional. So volume measurement of an organ like brain, is much superior than estimating biparietal diameter or just the area of the brain. Area of any geometric structure is measured by multiplying length and width of structure (it is two dimensional measurement) and is mentioned in square centimetres or millimetre. While volume measurement requires third dimension of depth and is mentioned in cubic centimetres or millilitres.

Also as stated above, the fetal brain volume may predict the occurrence of the disorders related to the brain like schizophrenia, autism and various syndromes etc. For this prediction, the estimation of normal fetal brain volumes in the population is absolutely necessary. More so the brain volumes in the neonatal, infant, and adults have been studied extensively. Furthermore, the literature search made in the databases such as Pubmed showed no Indian studies on the fetal brain volume measurements on the local population. All the references were from other countries. This prompted us to undertake the study which measures the normal fetal brain volumes and their correlation with the gestational age.

To determine fetal brain volume, 2-diamensional (2-D) ultrasound was the choice. This is because, wide spread availability of 2-Dimensional (2-D) ultrasound equipment, real time study, and cost effectiveness. 3-Dimensional (3-D)/4Dimensional (4-D) ultrasound equipments are available in few centres and measurement of brain volume is possible by 3-Dimensional/4Dimensional ultrasound, but there are few difficulties in using 3-Dimensional/4Dimensional ultrasound equipment. Time required acquiring volume data and its post processing is more, 3-Dimensional/4Dimensional ultrasound volume measurements require special training. Cost of 3-Dimensional/4Dimensional volume probe and its software is high. Image quality of 3-Dimensional/4Dimensional is not as good as, 2-Dimensional ultrasound Brightness (B) mode in good ultrasound machine.5,6,7,8 Other modalities such as magnetic resonance imaging (MRI) can also be used for the fetal brain volume estimation.
availability Magnetic Resonance Imaging machine, cost of machine, inability to use in moving objects like fetus are the limitations in Magnetic Resonance Imaging. Apart from these modalities, opportunities to study human fetus directly are rare.