

Obstetrics Sonography: A comprehensive screening approach for basic reproductive health of mothers

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Abstract: Babies come into the world heralding the good news that human species with all its diversities and complexities is going good. These journeys from two cells to newborn brings happiness to those around but some unfortunate babies born with birth defects. Basic obstetric care involves intra natal developmental and functional well being of new born. Desire to have a normal baby a variety of screening modalities are experimented and applied in routine practice Ultrasound examination provides an accurate and safe clinical assessment of the gravid uterus throughout pregnancy.

Keywords: Ultrasonography, sound wave, birth defects, obstetric care, reproductive healthcare.

I. INTRODUCTION

Ultrasound is sound waves with frequencies which are higher than those audible to humans (>20000Hz).[3] Ultrasonic images also known as sonograms are made by sending pulses of ultrasound into tissues using a probe. The sound echoes of the tissue ; with different tissues reflecting varying degrees of sound. These echoes are recorded and displays as an image to the operator. Ultrasound was initially developed as a submarine detection method in world war 1, In mid 1950 Ian Donald adapted the sonar device to scan for abdominal tumors, many of which turned out to be pregnancies[4]. By 1965 foetal bipartite diameter and blighted ova were being detected by the technique, which had become a routine method for estimating foetal growth and maturity in many hospitals by 1968. Many different types of images can be formed using sonographic instrument. The most frequently used is B-mode image which displays the acoustic impedance of a 2-dimensional cross section of tissue. Other types of image can display blood flow, motion of tissue over time, the location of blood, the presence of specific molecules, the stiffness of tissue or the anatomy of a three dimensional region.[7]. There have been dramatic advances in ultrasound technology, including improved spatial and contrast resolution, three dimensional and four dimensional imaging, harmonic imaging, new and improved ultrasound scanning probes and improved digital review workstations. With this our knowledge of normal anatomy, pathology and pathophysiology of disease have increased substantially. The internet has made communication among researchers easier.

II. METHODOLOGY

Ultrasound as a diagnostic tool in medicine:

Ultrasound has the potential for yielding important diagnostic information[7]. Compared to other conventional methods of medical imaging, ultrasound has several advantages,

- 1). It provides image in real time.
- 2). It is portable and can be brought to the bedside.
- 3). It is substantially lower in cost and
- 4). It does not use harmful ionizing radiation [1].

Ultrasound as a screening measure in obstetrics

Ultrasound is a powerful technology to see inside the womb. Different tissues give different patterns of ultrasound echo which offered a revolutionary way to look into the previously mysterious world of growing baby. Noninvasiveness and immediate reassurance to the mother makes ultrasound number one screening modalities in reproductive healthcare services in developed and developing countries. Maternal and neonatal morbidity and mortality are the two most important health indicators for a country. To ensure appropriate maternal and neonatal health, it is important that the quality of antenatal care is optimized based on current knowledge and available resources. Ultrasonography is now an established tool in the clinical management of whole intra natal period of every gravid women[7].

Screening with Ultrasound in mothers

Importance of screening in mothers[6] :All pregnancies are theoretically at risk for birth defects. An estimated 3,03,000 newborn dies within 4 weeks of birth every year worldwide due to birth defects. The prevalence of birth defects in India is 6-7% - 1:44 which is around 1.7 million birth defects annually. India has the highest number of children with birth defects, they affect approximately 1 in 33 infants and result in 3.2 million birth defects-related disabilities every year. The prevalence of high risk pregnancies in India is about 15% with only about 4% being diagnosed before delivery. At present Government Of India constituted an expert group to deliberate on use of Ultrasonography in pregnancy in detail and formulate guidelines. Government of India has introduced Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) from June 2016 onwards where on 9th of the every month pregnant woman (in 2nd/3rd trimesters of pregnancy) will receive all essential ANC services by Medical officer and OBGY specialist including Ultrasonography services.

Main purpose of Ultrasonography during pregnancy

1. Reduction in maternal and perinatal mortality and morbidity rate.
2. Early detection of abnormal foetal condition/anomalies and also early detection of high risk Pregnancies.
3. Improving capacity of health care providers in interpreting obstetric USG and making decision about Obstetric care.

Technical aspects of use of Ultrasonography during Pregnancy

- 1) Number of ultrasound in pregnancy
- 2) Timing of obstetric ultrasound
- 3) Who can perform obstetric ultrasound
- 4) Purpose /indication of obstetric ultrasound
- 5) Components of routine ultrasound scan
- 6) Equipment and maintenance
- 7) Consent forms and Reporting formats and
- 8) Follow up action.

Ultrasound practice in India

At present in India routine obstetric scan is done by Registered medical practitioner with expert ultrasound- diagnostic knowledge and experience, qualified under the PCPNDT act and defined parameter.[1,6].They carry out final care of cases screened and diagnosed with their skill and excellent technical background.

In India, Obstetric Ultrasound is mainly used for two purposes in mothers

- 1) Either to investigate a possible problem at any stage of pregnancies.
- 2) Routine scan at around 18 to 22 weeks of gestational age.

These scan includes detailed anatomical evaluation of the foetus, foetal biometry and surrounding environment. Ultrasound can pick up structural abnormalities as well as increased risk of genetic conditions [9]

Routine ultrasound obstetric scan screen includes

1. Foetal number
2. Qualitative or semi quantitative estimate of amniotic fluid
3. Placental location appearance and relationship to the internal cervical Os.
4. Umbilical cord- number of vessels in the cord and placental cord insertion site
5. Foetal Biometry-measurements of Bi-parietal diameter(BPD), head circumference(HC), abdominal circumference (AC) and femoral diaphysis length (FL).
6. Foetal anatomy survey [1,6,9,14] includes Head, face and neck ,Lateral cerebral ventricles, choroid pleaxus, midline falx, cavum septum pellucidi, cerebellum, cisterna magna, upper lip, Chest; Shape/size of chest and lungs, Heart; four chamber view, left ventricular outflow tract, right ventricular outflow tract, Abdomen; stomach (visualization, size ,sites), kidneys and urinary bladder, Umbilical cord insertion site into the foetal abdomen. Spine; cervical, thoracic, lumbar and sacral spine ,Extremities; leg and arm.

Advantages of early scanning with Ultrasonography

Congenital abnormalities are frequently diagnosed before birth, as many of the major fetal abnormalities can be detected by a prenatal ultrasound examination. This data derived from a routine ultrasound screening done at Urmi Hospital, Umreth, Tribhuvandas foundation, Anand and Kapadvanj in unselected population.

Table 1: Detection rates for specific conditions with ultrasound screening of unselected population

Condition	Post Menstrual Weeks	Detection Rate	Frequencies 1000/n
Anencephaly	10-12 weeks	98%	2.3 to 6.4
Spina Bifida	14-18 weeks	90%	4.3 to 7.9
Major Cardiac Anomalies	20-22 weeks	50%	2.6
Diaphragmatic Hernia	22-28 weeks	60%	0.24 to 4.0
Exomphalos	14-26 weeks	80%	3.3
Bilateral Renal Agenesis	24-28 weeks	84%	1.8
Lethal Skeletal Dysplasia	16-18 weeks	60%	0.8
Cleft Lip /cleft palate	15-19 weeks	75%	7.0 to 13.0

The overall detection rate for ultrasound screening are:

- 83% are abnormalities incompatible with life,
- 50% are serious abnormalities where survival is possible,
- 16% are those requiring immediate care after birth.

Current use of Ultrasonography in pregnancy

▪ Ultrasound scanning is considered the most important tool for prenatal diagnosis of fetal congenital abnormalities. It detects the majorities but not all of the fetal abnormalities Now in India young people tend to have fewer children, work longer and have less time and energy for the maintenance of children. One or two children is the norm in most families, while average age of women having children has increased. In higher social classes children become a consideration only after the establishment of a stable financial situation These societal changes – increasing maternal age, the number of pregnancy-related disorders also increases. At the same time, couple desire that their children be completely healthy and

that potential disorders be discovered as soon as possible. In this regard, the application of ultrasound diagnostic technique has a significant role for screening. So that early intervention and/ or pregnancy termination can be timely possible.

Biological effects of ultrasound

It affects in two ways:

- 1) Sonar beam causes heating of highlighted area by about 1°C . This is presumed to be non significant based on whole body heating in pregnancy which seems to be safe up to 2.5°C .
- 2) Cavitation -Where small pockets of gas which exist with in mammalian tissue vibrate and then collapse. The significance of cavitation effects in human tissue is unknown[4,5]

Adverse effects depend upon:

- 1). Acoustic output.
- 2). Exposure time.
- 3). No of exposure per subject.
- 4). Timing during the pregnancy.

Effects on pregnancies: Growth restriction, Delayed speech, Dyslexia, Non right handedness, Damage to nerve cells covered with myelin.[4,7]

III. CONCLUSION

In India improvement in the living standard, education and hygienic condition of people government is also improving the standard of pregnancy care. With in this context use of diagnostic ultrasound has to be given special emphasis. The use of ultrasound has revolutionized in medicine including obstetrics (pregnant women). The value of ultrasound examinations depends heavily on the preparation of the personnel carrying out the examination and the technical capabilities of the equipments they use. To do intra natal screening with ultrasonography is not compulsory but with BRAIN model (Benefits, Risks, Alternatives, Listening to your Intuition and do Nothing to decide what is right for you). Implication of scanning need to be considered for each mother and baby according to their specific situation by expert trained persons with ALARA (As Low As Reasonably Achievable) principle. All mothers should be informed about the purpose and potential outcome of scanning with ultrasound and having an opportunity to discuss their option before the scan is performed.

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