Summary & Conclusion
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While hepatitis B infection in pregnancy has been well characterized in many countries of the world including India, HCV infection pattern is yet to be completely documented. Authenticated documentation on pregnancy hepatitis, maternal-fetal outcome, transmission pattern and impact of preventive measures by vaccination are essential features to plan and implement health delivery measures in our country. The present study conducted during the years 2000-2003 has evolved a comprehensive picture on the pattern of HCV prevalence and transmission among asymptomatic pregnant women (n=3115) and babies born to HCV positive pregnant women (n=12).

The study conducted on "Studies on hepatitis C virus (HCV) infection in asymptomatic pregnant women and its transmission from mothers to children" was analysed under four major heads.

i) Prevalence pattern of HCV infection in asymptomatic pregnant women.

ii) The HCV carrier rate among the pregnant women and rate of HCV transmission from mother to babies.

iii) HCV genotype pattern of HCV-RNA positive mothers and the children born to them.

iv) Molecular sequencing of HCV genotypes of the HCV-RNA positive mother-child pairs and their cluster analysis.

This study was conducted at the Department of Microbiology, Dr. ALM PGIBMS, Taramani, University of Madras in collaboration with National Institute of Epidemiology (ICMR), Chennai. The hospitals from where the antenatal women were included in the study after obtaining written informed consent from each of the participants were Institute of Obstetrics and
Gynaecology for Women and children, Egmore, Chennai, Nagamani Nursing Home, Royapuram, Chennai, Kasturbha Gandhi Hospital Triplicane, Chennai. Institutional ethical clearance was obtained from the Institutional Review Board of Dr. ALM PGIBMS, Taramani, University of Madras.

The study was part of the major ICMR project entitled, "A study on the transmission pattern(s) of Hepatitis B virus (HCV) in symptomatic / asymptomatic pregnant women and their impact on pregnancy outcome and on children born to them" conducted at the Department of Microbiology, Dr. ALM PGIBMS from August 2000 to April 2003.

7.1 PREVALENCE OF HCV INFECTION IN ASYMPTOMATIC PREGNANT WOMEN

7.1.1 Analysis of demographic data among the asymptomatic pregnant women included in the study

7.1.1.1 Screening for the evidence of HCV infection by testing anti-HCV was carried out in 3115 healthy asymptomatic pregnant women, attending the antenatal clinics of the hospitals of the city as mentioned earlier.

7.1.1.2 When the anti-HCV positivity was analysed in correlation with socio-economic status of the study subjects, anti-HCV positivity of 0.58% (18/3115) was observed among the pregnant women belonging to low socio-economic status and none of the pregnant women belonging to the middle and the upper middle cases of the study population was positive for anti-HCV.

7.1.1.3 The educational status among the healthy asymptomatic pregnant women analysed in the present study revealed that out of 3115 asymptomatic pregnant women analysed, 13.1% (406/3115) were
illiterate, 86.8% (2709/3115) were literate with varying levels of education. The anti-HCV positivity was 0.7% (3/406) of the illiterates and 0.55% (15/2709) among the literate pregnant women, the difference was not statistically significant (p<0.09).

7.1.1.4 An analysis for the impact of occupation on acquiring HCV infection by asymptomatic pregnant women has revealed that – 92.9% of the 3115 asymptomatic pregnant women were housewives and 7.1% were employed women. Anti-HCV positivity was 0.6% in the housewives and none were positive with the employed women category. Injuries that are common among housewives makes room for further studies to delineate the role of injuries in transmission of HCV.

7.1.1.5 Previous clinical history of the antenatal women in this study has shown that - 10.1% (314/3115) had previous history of jaundice; 45.4% (1415/3115) were hospitalized; 1.4% (46/3115) had received prior blood transfusions and 0.1% (5/3115) received blood products.

7.1.1.6 Since injections seem to influence the chance of acquiring HCV infection, an analysis from their previous history of the asymptomatic pregnant women was made for their frequency of taking injections for various clinical problems. It revealed that, 73.4% had < 10 times of injections, 9.2% had injections 10 to 20 times and 0.1% had multiple injections (> 20 times) in the past two years. 50% (9/18) of the anti-HCV positive cases were those who had taken injections < 10 times in the past two years and the other 50% (9/18) of anti-HCV positive cases had not taken injections in the past two years. Hence it has to be surmized that it is the sterility condition of the syringes and needles that are to be
considered as influencing factor and not the frequency of injections.

7.2 HCV MARKERS (ANTI-HCV AND HCV-RNA) POSITIVITY PATTERN IN ASYMPTOMATIC PREGNANT WOMEN

7.2.1 An overall anti-HCV positivity of 0.57% (18/3115) was observed. 44.4% (8/18) of the anti-HCV positive antenatal women were positive for HCV-RNA by RT-PCR.

7.2.2 A trimester wise analysis of anti-HCV positivity cases has revealed that the positivity rate was 0.2% in the 2nd trimester; 0.2% in the 3rd trimester and 0.06% at delivery. However, there was no positive case detected in the first trimester.

7.2.3 Anti-HCV positivity analysis in relation to age was made in asymptomatic pregnant women. It revealed that majority of the study subjects (76.5%) were of the age group 21-30 years followed by 15-20 years age groups (18.4%). The lowest rate was observed in 31-40 years age groups (4.9%). The anti-HCV positivity in them was 1.04% (15-20 years), 0.5% (21-30 years) and none of them were anti-HCV positive in the 31-40 years age group.

7.3 CLINICAL AND BIOCHEMICAL PROFILE OF THE ANTI-HCV POSITIVE ASYMPTOMATIC PREGNANT WOMEN

7.3.1 While clinical examination was done for all study subjects for their physical well being, indepth examination was done for the anti-HCV positive pregnant women. However, there was no clinically detectable abnormality seen.
7.3.2 The anti-HCV positive asymptomatic pregnant women and their babies when analysed for liver enzyme profile that included serum bilirubin, SGOT, SGPT and SAP from the time of collection till the 12th month follow-up had normal levels of all parameters analysed. There was no indication of biochemical abnormality in them.

7.4 Follow-up of all the 18 anti-HCV positive pregnant women was attempted with the assistance of the field team of National Institute of Epidemiology, Chennai for a period of 12 months.

7.4.1 12 mother/child pairs of this group could be successfully followed up both clinically and by repeat blood examination.

7.4.2 6 antenatal pregnant women were lost in follow-up, in which one child expired at the time of delivery due to respiratory complication. Of the remaining 5 cases that were lost in follow-up, 3 mothers did not give their consent for the follow-up and address could not be traced in case of two women.

7.5 PATTERN OF HCV TRANSMISSION TO CHILDREN BORN TO HCV-RNA POSITIVE MOTHERS.

7.5.1 25% HCV transmission was observed in 2 of the 8 babies born to 8 HCV-RNA positive mothers who were followed up for 12 months. Only one of the two HCV-RNA positive babies seroconverted and became anti-HCV positive by the 12th month whereas, the other baby continued to be sero negative for anti-HCV while positive for HCV-RNA throughout the entire period of follow-up.

7.5.2 None of the anti-HCV alone positive mothers transmitted HCV infection to the children born to them.
7.6 HCV GENOTYPE PATTERN OF HCV-RNA POSITIVE MOTHER/CHILD PAIRS.

7.6.1 In order to document the HCV genotype distribution pattern in antenatal women of this geographic location, which might add valid data on molecular Epidemiology of HCV in India, HCV-RNA positive mother/child pair serum samples was subjected for genotyping by HCV-II INNOLiPA hybridization assay.

7.6.2 HCV genotyping of the two HCV-RNA positive mother/child pairs revealed persistent presence of mixed genotypes 1a and 4 in all serial samples collected at the time of delivery, 3rd month, 6th month, 9th month and 12th month of the follow-up period. This also confirms that the child has acquired HCV only from the respective mother by vertical/perinatal means.

7.7 SEQUENCE ANALYSIS OF HCV-RNA POSITIVE MOTHER/CHILD PAIRS.

7.7.1 The HCV-RNA positive samples of the two mother/child pairs were sequenced by direct sequencing method using ABI prsm 3700 DNA Sequence Analyzer at Centre for Cellular and Molecular Biology, Hyderabad. Cluster analysis was done using clustal W software.

7.7.2 96% homology of HCV genome was observed among the first mother/child pair and 99% homology was observed among the second mother/child pair. Sequence analysis further confirmed that the genotypes were 1a and 4 as obtained by the line probe assay.

7.7.3 This study further confirmed that Line probe assay could be a handy non laborious tool for HCV genotype determination.
This study gains importance since it is the first report from India which had successfully attempted to analyse the rate of the vertical / perinatal transmission of HCV from infected mothers to the children born to them by a prospective longitudinal follow-up study and to characterize the genotype (s) of HCV present in the HCV infected mother / baby pairs, so as to confirm the source of HCV acquired by the new born babies.