Original Article

ROLE OF MEAN CORPUSCULAR VOLUME AS SCREENING TEST FOR THALASSAEMIA IN PREGNANT WOMEN AT ISRA UNIVERSITY HOSPITAL HYDERABAD

Amna A[1], Zehra N[2], Haider G[3], Anjum F[4], Rani S[5], Munir AA[6]

ABSTRACT

Objective: To see the sensitivity, specificity, positive and negative predictive value of mean corpuscular volume (MCV) in screening for beta thalassemia minor in pregnant women attending antenatal clinic at Isra University Hospital (IUH) Hyderabad.

Methodology: This validation study was conducted at the department of obstetrics & gynecology Isra University Hospital Hyderabad from 1st November 2004 to 30th October 2005. Women were interviewed using a pre designed questionnaire regarding their demographic profiles & Gestational age at the time of presentation. On their first antenatal visit MCV were checked as less than or equal to 70 ft on complete blood picture. HbA2 level were assessed by Hemoglobin electrophoresis to find out the carrier of beta thalassaemia minor. The data was analyzed on SPSS vr 15.

Results: This study showed that MCV is a good screening test for beta thalassemia minor. Out of 100 screened subjects 53% had MCV less than 70 fl or equal to 70 fl. Positive MCV test (< 70 fl) showed a sensitivity of 79% and specificity of 30% in screening for beta thalassaemia trait. The positive and negative predictive values were 56% respectively.

***Conclusions*:** Our study showed that MCV is 79.9% sensitive and 30% specific and positive and negative predictive value is 56% in detection of beta thalassaemia minor. It was found to be a good screening tool in pregnant women for beta thalassaemia. This test can be adopted in future as part of evaluation for sub fertility in all young women.

KEY WORDS: Beta thalassaemia, Mean corpuscular volume, Antenatal screening.

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1. Dr. Ambreen Amna FCPS
Senior Registrar,
2. Dr. Nishat Zehra , FCPS
3. Dr. Gulfareen Haider, FCPS, M.S
4. Dr Farhana Anjum FCPS
5. Dr. Shazia Rani , FCPS
6. Dr. Aftab Afroz Munir, FRCOG
1-6: Department of Obstetrics & Gynecology,
Isra University Hospital, Hyderabad, Sindh, Pakistan.
Correspondence:
Dr. Ambreen Amna Siddiqui,
Email: amb4_siddiqui@yahoo.co.in

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INTRODUCTION

Thalasssaemia is an important health issue in Pakistan.[1] Approximately 40,000 cases of transfusion dependent children with thalassaemia major are presently registered and each year nearly 5,000 affected children are born in Pakistan.[2] Thalassaemia refers to a group of inherited disorders of hemoglobin (Hb) synthesis and is the commonest monogenetic disorder world wide[3] with a carrier frequency rate of 5%.[4] Carriers of beta thalassaemia minor are usually asymptomatic however they have a 25% chance

of having children with severe out comes if their spouses are also carriers of the same type of thalassaemia.[5,6] Globally about 100,000 living patients with homozygous â thalassaemia are present. Presently allogeneic haemopioetic stem cell transplantation (HSCT) is the only curative treatment[7,8] but this is out of reach of certain populations including Pakistan. Antenatal screening and diagnosis is a promising strategy for the reduction of mortality and morbidity from thalassamia in countries where they prevail, such screening is feasible and acceptable in a Muslims country such as Pakistan.[9,10]

Antenatal screening by complete blood picture (CBC) and mean corpuscular volume (MCV) is simple, cost effective and useful screening test for detection of carrier of beta thalassaemia minor and by this simple test we can prevent the birth of affected children by offering prenatal diagnosis[10] and can decrease the number of new born with thalassaemia major.[11]

METHODOLOGY

This study was conducted at the antenatal clinics of obstetrics & gynecology department Isra University Hospital From 1st November 2004 - 30th October 2005, based on sample of convenience. 100 pregnant women were selected who had MCV less than or equal to 70ft on blood complete picture. Raised Hb A2 level were assessed to find out the carrier of Beta thalassaemia minor by performing cellulose acetate membrane electrophoresis (Hb electrophoresis) sample was collected in EDTA bottle (1.7mg EDTA/ml) and analyzed in pathological lab of IUH. Women with other forms of anemia or known thalassaemic were excluded from the study. A proforma for each patient was completed regarding the relevant information of age, education, occupation, and consanguinity & Gestational age. Data was analyzed on SPSS vr 15 for frequency and percentage.

Table-I: Gestational age and rate of consanguinity among study participant values are given as median (range) and n (%). n = 100

Gestational Age	*n= 100*	*%*
First Trimester (0-14 weeks)	24	(24)
Second Trimester (14–28 weeks)	19	(19)
Third Trimester (28-42 weeks)	57	(57)
Consanguinity		
Yes	68	(68)
No	32	(32)

RESULT

Hundred pregnant women were selected after filling proforma the mean age of selected sample was 27.7 ± 4.8 years respectively, 47% of women belonged to urban community; whereas 53% of pregnant women were the residents of rural area. As regards to the time of presentation to hospital 57% were present during third trimester 19% were in the second 24% of the women were in first trimester. (Table-I)

The hemoglobin concentration of hundred pregnant women was found to be 9.34 ± 1.2 gm/dl; whereas the median, mode and range were 9.4, 10, & 6.7 gm/dl respectively. The maximum hemoglobin level of participants in this study was 13.3 gm/dl; whereas, the minimum was 6 gm/dl. The mean ± SD MCV is found to be 65.2 ± 5.75 fl; whereas the median, mode and range of MCV are 66, 75, & 46.1 fl respectively. The maximum MCV of participants in this study is 70.0 fl; while the minimum MCV is 50 fl. Among positive MCV, 42% had raised Hb A_2 and 33%

Table-II: Sensitivity, specificity, positive predictive value and negative predictive value of MCV in prediction of beta thalassaemia carrier status

MCV	*Hb A_2 Raised*	*Hb A_2 Normal*	*Total*
Positive (< 70 fl)	42 (True positive)	33 (False Positive)	75
Negative (>70fl)	11 (False Negative)	14 (True Negative)	25
Total	53	47	100

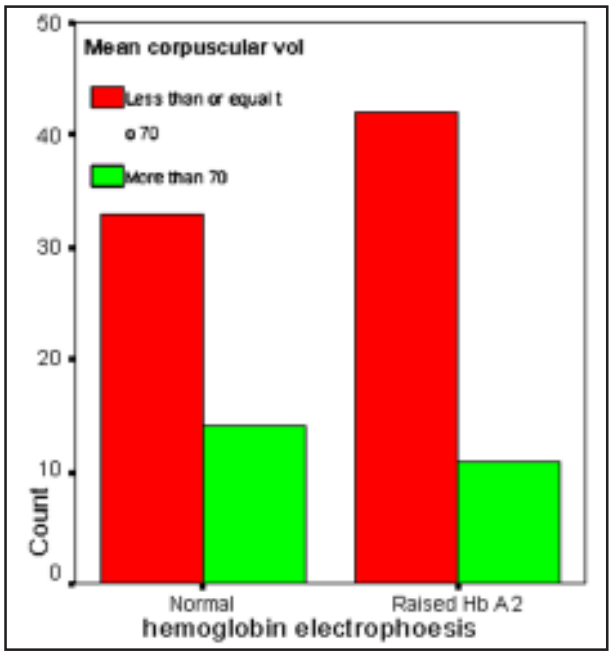
Sensitivity = a/a+c; 42/53 = 79.2%. Specificity = d/b+d; 14/47 = 30%
Positive Predictive Value = a/a+b; 42/75 = 56% Negative Predictive Value = d/c+d; 14/25 = 56%

had normal Hb A_2. Whereas, among negative MCV pregnant women, 11% had raised Hb A_2 and 14% had normal Hb A_2. The hemoglobin electrophoresis was used as a gold standard test for the screening of MCV study showed that 47% of the pregnant women had normal values and 53% had raised Hb A2 on hemoglobin electrophoresis test. (Graph-1) MCV testing is a good screening test for thalassemia traits' giving a sensitivity, specificity, positive predictive value and negative predictive value of 79%, 30%, 56% and 56% respectively. (Table-II)

DISCUSSION

Thalassaemia is the hematological disorder most commonly encountered in obstetrics practice world wide[3] with limited available national resources it is not possible to provide blood transfusion and iron chelation therapy to all patients.[7]

Bone marrow transplantation (BMT) which is available in Pakistan is expensive and out of reach of poor people.[12] it is therefore prevention by screening test is least expensive and most effective means to deal with beta thalassaemia in Pakistan and obstetrician should be familiar with the necessary investigations for the identifications of high risk couples. Current study showed that MCV screening in antenatal patient for beta thalassaemia is simple, logistics and cost effective with minimal false positive and false negative results. Sirichotiyakul[6] also showed that MCV is simple, reliable, and cost effective and practical in primary health centre. Similarly Zaidi et al[10] also showed in their study that MCV is a sensitive and reliable indices for detection of beta thalassaemia trait. It can be applicable in a population based screening programme to identify those women who required further lab investigation like Hb A_2 thus make it good screening test. Lack of knowledge and less education is one of the factor for propagation of disease In this study 47% of pregnant women were from to urban area, where as 53% were from to rural area. Similarly Baig SM[2] also showed that carrier of thalassemia were more in low income group and rural areas. Being an



Graph-1: Shows normal and raised Haemoglobin Electrophresis (n =100)

Islamic country and socio cultural background cousin marriages are very common. In current study the consanguinity rate were high about 68% of the women were married to their first cousin. Similarly in a study conducted by Mehmoona Hafeez et al[1] that 76.55% of patients were married to their 1st cousin or relative in Pakistan thus predisposing to high genetic risk. In this study the ratio of women presenting in third trimester is quite high, this is because poor women usually come to hospital when they have convenient time facilities available to bring them to hospital and pregnancy related disorders. Barbara bain[11] found that booking at antenatal clinic was often delayed less than half the women booked during the third trimester, women of Mediterranean origin who might be expected to best informed about beta thalassaemia trait earlier did not present to the antenatal clinics.

In current study selected population of 100 pregnant women whose MCV is < or equal to 70fl were chosen and the reliability of MCV as a screening test was assessed. In current study the mean ± SD, MCV is found to be 65.5 ± 5.75fl, whereas the median, mode, and range of MCV are 66, 75, 46, respectively. The maximum MCV

of the participant in the study was 70 fl while the minimum MCV is 50 fl. Several studies have been made to diagnose the condition by MCV screening. According to study by Cronin EK[13] that MCV of 72 fl has more sensitivity and specificity for diagnosis of thalassaemia. Similarly Afroz M [14] also found that MCV screening is a very convenient protocol with a positive predictive value of > 91% in a highly prevalent areas for thalassemia. Hemoglobin concentration is a poor screening tool for thalassemia trait as it is most often with in normal limit.[3] In current study, the haemoglobin concentration of hundred pregnant women was (mean ± SD) to be 9.34 ± 1.2 g/dl. Where as the median mode and range were 9.4, 10 & 6.7g/dl respectively. The maximum Hb level of participant in this study was 13.3g/dl, while the minimum level was 6 g/dl. Suhaib Ahmed[4] also showed that the Hb concentration is often low with mean Hb 10.4g/dl, observe range 7.9g/dl - 12.4 g/dl. Hemoglobin electrophoresis is a diagnostic tool for detection of carrier of beta thalassemia; Hb electrophoresis was applied as a gold standard test. Hemoglobin electrophoresis was categorized as normal or raised HbA_2.47% of the pregnant women has normal value and 53% had raised HbA_2 on Hb electrophoresis.

In current study, among positive MCV 42% had raised Hb A2 and 33% had normal Hb A2 level, where as among negative MCV 11% had raised Hb A2 and 14 % had normal Hb A2. MCV as a screening test for thalassemia trait, giving a sensitivity of 79.9% specificity of 30%, positive and negative predicative value of 56% respectively. In contrast to study by S. Sirichotiyakal et al[6] that sensitivity (MCV,<80fl) was 92.2%, specificity 83.9% negative predictive value 99 and positive predictive value 37% respectively

Thus when we use MCV evaluation as a screening test we have to do diagnostic test (Hb electrophoresis) for the conformation in relatively large number of women.

CONCLUSION

MCV is considered as a cost effective screening test for detection of thalassemia. Its sensitivity & specificity is acceptable in the present study Hemoglobin electrophoresis is a gold standard test applied to those who have low MCV (less than or equal to 70 fl). Thus by doing routine antenatal screening by MCV we can prevent the thalassemia.

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