INTRODUCTION-The endothelium is a thin mononuclear layer that covers all the inner surface of the blood vessels, separating the circulating blood from the tissues. Endothelium once believed to be an inert edge between artery and blood, is now recognized as organ per se. Vascular endothelium performs an array of homeostatic functions within normal blood vessels, located between the blood lumen and the vascular smooth muscle cells. It has now become clear that endothelium cells plays an important role in the endothelium derived relaxing factor (EDRF), identified as nitric oxide (NO) by **Flavahan NA 1992**(1)..Sickle cell disease is a prototype of structural haemoglobinopathy affecting humans. Autosomal recessive disorder involves substitution of thiamine for adinine encoding valine instead of glutamine in the 6th position of β-chain. Average incidence of sickle cell disease is approximately 4.3% in India **(Kar BC et al 1987)**(2). **Endothelial dysfunction in sickle cell disease** has been demonstrated by various workers by biochemical and physiological methods. These study suggest the endothelial dysfunction may prevent the arterial diameter of patients with sickle cell disease from adopting to chronic or acute shear stress elevations. This may contribute to the pathophysiology of vaso-occlusive crisis in patients with sickle cell disease .

**MATERIALS AND METHODS**-The present case control study was carried out in Department of Medicine and Department Of Radio Diagnosis, J K Medical college and research center Bhopal M.P India. It included total 50 subjects, equally divided in between cases & controls. Cases included sickle cell disease (HbSS) and sickle cell trait (HbAS) both during crisis and steady phase. 25 age and sex matched controls were also included accordingly in sickle cell anemia and trait groups. Controls included subjects those who have no evidence of any disease clinically and belonging to the same age and sex group as the patients.Age group; 15-40 yrs, patients of sickle cell disease include sickle cell anaemia (ss) & sickle cell trait (SA) normotensive .Who want to participate in study, were included in study **.**And patient with History of blood transfusion during last 3 months, treatment with vasodilators, hydroxyurea, smoking , Diabetes Mellitus,hypertension, congestive cardiac failure ,renal insufficiency, ischemic heart disease, dyslipidemia were excluded from study. Endothelial dysfection was assessed by brachial artery flow mediated dilatation by colour Doppler (non-invasive method)by using **Siemens Sonoline 500.**The measurements were performed. **First** – After rest of 10 minutes (baseline diameter) ,**Second** – After the right forearm was compressed by inflation of pneumatic tourniquet at a pressure of 200 mmHg for 5 minutes. The diameter of brachial artery were measured 1 ½ minutes after the release of pressure. Scanned area was marked to measure the same segment of brachial artery repeatedly i.e. 1st at rest, 2nd after reactive hyperemia(3,4).

**Calculation of FMD%-( flow mediated dilatation)= Brachial .Artery diameter after hyperemia – Brachial Artery diameter. at rest/ Brachial .Artery .diameter. at rest x 100 .**And Statistical analysis was performed using Software Statistical Package for Social Sciences (SPSS) (version 11.5, SPSS Inc, Chicago, IL). T test, chi-square test, and Chi-square trend for linear association were performed. All means are expressed as ± standard deviation. P < .05 was considered significant . Result: In control group majority of males (82.67%) and females (75%) were found in age < 30 yrs. The mean age of male and female were 24.41 (± 6.59) yrs and 25.00 (± 7.56) yrs respectively. The difference in mean age was statistically insignificant (p > 0.05). In sickle cell trait group majority of males (85.7%) and females (60%) were found in age < 30 yrs. The mean age of males and females were 24.00 (± 7.32) yrs and 23.80 (± 8.25) yrs respectively. The difference in mean age was statistically insignificant (p > 0.05).In sickle cell disease group majority of males (75%) and females (80%) were found in age < 30 yrs. The mean age of male and female were 23.63 (± 6.47) yrs and 21.80 (± 6.87) yrs respectively. The difference in mean age was statistically insignificant (p > 0.05). In AS group majority of males (85.7%) and females (60%) were found in age < 30 yrs. The mean age of males and females were 24.00 (± 7.32) yrs and 23.80 (± 8.25) yrs respectively. The difference in mean age was statistically insignificant (p > 0.05).In SS group majority of males (75%) and females (80%) were found in age < 30 yrs. The mean age of male and female were 23.63 (± 6.47) yrs and 21.80 (± 6.87) yrs respectively. The difference in mean age was statistically insignificant (p > 0.05).

As compared to control group significant difference was observed in mean FMD (%) in both trait & disease group.(p<0.05), also significant difference was demonstrated between AS and SS group. In all age groups significant difference was observed in cases as compared to control group.(p<0.05).Significance difference was observed between male in case and control groups (p<0.0001). Similar findings were observed between females (p<0.0001) .

**DISCUSSION:** study included total 50 subjects equally divided between cases and controls. Cases included sickle cell disease (SS) and sickle cell trait (AS). 25 age and sex matched controls were also included those who had no evidence of any disease clinically and belonging to the same age and sex group as the patients. 25 sickle cell anemia cases were studied and divided into 2 groups – sickle cell disease (HbSS) & sickle cell triat (HbAS) which included 13 and 12 patients respectively **.** In the present mean FMD%, that is mean % increased in the lumen diameter of brachial artery after stress (ie., reactive hyperemia), was significantly reduced in sickle cell anaemia cases (8.08±2.73) as compared to control (15.39±3.04), p<0.0001.Compared to control group (15.39 ± 3.04) significant difference was observed in mean FMD% in both sickle cell trait (9.72 ± 1.97) and sickle cell homozygous (SS) group (6.56 ± 2.50) p < 0.05.FMD% was significantly lower in patients with steady phase as compared to control group (8.42±0.99 v/s 15.39±3.04 in SS group and 11.42±1.48 v/s 15.39±3.04 in AS group.These findings corroborate with the works of ***Zawar SD et al 2002-03***(5) They found that FMD% was significantly lower in cases as compared to controls (p < 0.05). Results of the present study consistent with the work of ***Zawar SD et******al***. They found that endothelial dysfunction was significantly more in sickle cell anaemia as compared to sickle cell trait cases. In all age groups significant reduction in mean FMD% were observed in cases as compared to control group. according to ***Blum 2005*** (6) Flow mediated dilation (FMD)% was 4.57+/- 4.11 at steady state, compared with the control group FMD of 11.64+/- 7.69% (p< 0.001)., compared with control group FID of 24.17+/- 11.87% (p< 0.001) & findings shoed reduction in FMD. ***A Aessopos - ‎2007*** (7) &***Rambaran ; B Jiang2007***(8) significant reduction in FMD in disease compare to control.Significant reduction in mean FMD% was observed between male in case and control .When compared to male and female in both case and control group no significant difference were observed.

**CONCLUSION**

The conclusion drawn from the present study are as follows-FMD% a marker of endothelial function was significantly lower in cases as compared to controls and was also lower in AS & SS when compared to control group & significantly lower in SS group than AS group.

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7.Endothelial function and arterial stiffness in sickle-thalassemia patients

[Athanasios Aessopos](http://yadda.icm.edu.pl/yadda/contributor/98fa67c0ae6e65de423bf460cbbcdab1)  [Dimitrios Farmakis](http://yadda.icm.edu.pl/yadda/contributor/c7c4a68372abbd46a2e5d065f805d3e0)  [Maria Tsironi](http://yadda.icm.edu.pl/yadda/contributor/27071afb2835f8982b3022f48cb489c5)  [Evanthia Diamanti-Kandarakis](http://yadda.icm.edu.pl/yadda/contributor/4f93fbf3ac62294bc6f4b85e6596bf9c)  [Marina Matzourani](http://yadda.icm.edu.pl/yadda/contributor/9f8834405cca37c3ffafd257af0c638e)  [Christina Fragodimiri](http://yadda.icm.edu.pl/yadda/contributor/3c7a0685877b4427bd008aefe8a3c4d8) [Antonia Hatziliami](http://yadda.icm.edu.pl/yadda/contributor/14965c6a56d54daf3146b27ce78757ab)  [Markisia Karagiorga](http://yadda.icm.edu.pl/yadda/contributor/ef03bf84dfb70aed104838ac8254fde6)

[2007](http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.elsevier-74328ace-e018-3006-9801-3612248a4193) | [191](http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.elsevier-49a154d9-a1d8-3d2b-a00b-fb8bd03b1b62) | [2](http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.elsevier-71f58465-e558-3973-9b0c-e57656fd6061) | 427-432

8. Assessment of endothelial function: comparison of the pulse wave response to beta(2)-adrenoceptor stimulation with flow mediated dilatation

Contribution to journal › ArticleC Rambaran ; B Jiang ; J M Ritter ; [A Shah](https://kclpure.kcl.ac.uk/portal/ajay.shah.html) ; [L Kalra](https://kclpure.kcl.ac.uk/portal/lalit.kalra.html) ; P J Chowienczyk feb2008, vol/2, doi <http://dx.doi.org/10.1111/j.1365-2125.2007.03006.x>

Table-1

Age & Sex distribution of the study group

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age  Grop (year) | Sickle cell trait(AS) | | | Sickle cell disease(SS) | | | Control | | |
|  | M(%) | F(%) | T(%) | M(%) | F(%) | T(%) | M(%) | F(%) | T(%) |
| <20 | 1(14.3) | 2(40) | 3(25) | 2(25) | 2(40) | 4(30.8) | 4(23.8) | 2(25) | 6(24) |
| 20-29 | 5(71.4) | 1(20) | 6(50) | 4(50) | 2(40) | 6(46.2) | 10(58.8) | 4(50) | 14(56) |
| 30-39 | 1(14.3) | 2(40) | 3(25) | 2(25) | 1(20) | 3(23) | 3(17.6) | 2(25) | 5(20) |
| Total | 7 | 5 | 12 | 8 | 5 | 13 | 17 | 8 | 25 |
| Mean ±SD | 24.00  ±7.32 | 23.80  ± 8.25 | 23.92  ±7.35 | 23.63  ±6.47 | 21.60  ±6.87 | 22.92  ± 6.40 | 24.41  ±6.59 | 25.00  ± 7.56 | 24.60  ±6.76 |

P>0.05

Table-2

Correlation of endothelial dysfunction in case compared to control

|  |  |  |  |
| --- | --- | --- | --- |
|  | case | control | P |
| Mean ±SD  (FMD%) | 8.08±2.73  (n=25) | 15.39± 3.04  (n=25) | P<0.0001 |

Table-3

Correlation of endothelial dysfunction in case compared to control according to age

|  |  |  |  |
| --- | --- | --- | --- |
| Age | Case  Mean FMD% | Control  Mean FMD% | P |
| <20 | 8.00±2.33(n=7) | 16.16±1.71(n=6) | P<0.05 |
| 20-29 | 7.81± 2.83(n=12) | 15.05±3.40 (n=14) | P<0.05 |
| 30-39 | 8.71± 3.33(n=6) | 15.42±3.57(n=5) | P<0.05 |

Table-4

Correlation of endothelial dysfunction in case compared to control according to sex

|  |  |  |  |
| --- | --- | --- | --- |
| Sex | Case  Mean FMD% | Control  Mean FMD% | P |
| Male | 7.29±2.70 | 15.66±3.18 | P<0.0001 |
| Female | 9.26±2.45 | 14.83±2.81 | P<0.0001 |
| P | p>0.05 | p>0.05 |  |