

# **Effect of smoking on quality of red blood cells collected from donors who are smokers and stored for a period of 35 days in the blood bank**

## **ABSTRACT**

**AIM & OBJECTIVES:** To study the effect of smoking on quality of red cells (RBC) collected from donors who are smokers and stored for a period of 35 days in the blood bank by means of estimation of biochemical and haematological parameters including supernatant haemoglobin (Sup-Hb), percentage haemolysis and scanning electron microscopy (SEM) of RBCs.

**MATERIALS & METHODS:** This was a prospective case control study done in the Department of Transfusion Medicine and Immunohematology, Christian Medical College, Vellore, which was approved by Institutional Review Board. Cases were samples selected from healthy active smokers (n=36) who fulfilled the inclusion criteria and were fit to donate and controls (n=36) were normal healthy non-smoking donors. Complete blood count with peripheral blood smear examination, Heinz body preparation and bilirubin estimation was done on samples obtained at the time of donation. Sup-Hb was estimated by spectrophotometry on day 1, day 7, day 14, day 28 and day 35. SEM of RBC was done on 6 samples which were collected at the time of donation (4 smokers and 2 non-smokers) at the National Centre for Biological Science and Indian Institute of Science, Bangalore.

**RESULTS:** There was no significant difference in the median Sup-Hb on day 35 for smokers and non smokers. The median Sup-Hb on day 35 for smokers and non smokers were 1.17g/L (95% CI: 0.95 - 1.39) and 1.26g/L (1.01 - 1.51) respectively.

The median Heinz body in smokers was 19.5% (95% CI: 13.6 - 25.2) and the difference between smokers and non-smokers was not statistically significant. In SEM, RBCs of 2 out of 4 smokers displayed abnormal shape (Mexican hat like projections) and the defect in the RBC membrane was clearly visible. RBC of 2 out of 2 non-smokers showed smooth membrane surfaces with no irregularities. Ultrastructure of RBC membrane (SEM at 1 kV) of 2 out of 4 smokers showed small globular and blister-like areas. The hematocrit and mean platelet volume (MPV) for smokers were higher compared to non-smokers and the differences were statistically significant. Haemoglobin level was higher and the platelet count was lower in smokers compared to non-smokers, but both the differences did not reach statistical significance. Median total bilirubin level in smokers [0.43mg/dL (95% CI: 0.35 - 0.50)] was lower compared to non-smokers (0.53mg/dL[95% CI: 0.45 - 0.60]) and similarly the median indirect bilirubin level in smokers (0.26mg/dL[(95% CI: 0.21 - 0.31)]) was lower compared to non-smokers (0.31mg/dL[0.24 - 0.37]), but both the differences did not reach statistical significance. The median direct bilirubin level was significantly lower in smokers (0.20mg/dL[95% CI: 0.17 - 0.22]) compared to non-smokers (0.24mg/dL[95% CI: 0.21 - 0.27],  $p < 0.05$ ).

**CONCLUSION:** Although smokers' RBC showed ultra structural changes in SEM, percentage haemolysis and supernatant haemoglobin was comparable to non-smokers. Smokers displayed higher hematocrit, haemoglobin, MPV and lower platelet count and bilirubin levels compared to non-smokers. The probable reason for low bilirubin, an endogenous antioxidant is that it is used for the protection of RBC from oxidant stress as a result of smoking.