Hyperbaric Oxygen, Its Role to Platelet Aggregation in Non-Insulin-Dependent Diabetes Mellitus (NIDDM)

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INTRODUCTION
Diabetes is an important health problem because of its high morbidity and mortality. Hyperglycemia for a long time could damage the component of organs such as rheological disorder, such as platelet aggregation and blood viscosity. Hyperbaric Oxygen Therapy HBOT 100% O2 3 ATA for 2 hours could help Nitric Oxide (NO) regeneration. NO could activate the HbOT could decrease the latency time, aggregation speed, aggregation index, and aggregation percentage with the collagen aggregator in the NIDDM patients.

METHODS
The selected NIDDM patients who fulfilled inclusion criteria (weight and height, physical examination, thoracic photograph, and ECG) as a prerequisite before performing HBOT therapy. The treatment group were experience the HBOT in High Pressure Chamber (HPC) in Lembaga Kesehatan Kelautan (LAKELSA) RSAL Dr. Ramelan Surabaya

PLATELET AGGREGATION TEST (PAT)
The blood was collected with a clean venipuncture. Blood volume was added to one volume of trisodium citrate 3.8% and was centrifuged at room temperature 10-12x5 minutes at 200-220 g’s (g = 11.28 x 10 6 x centrifuge radius in cm x the speed in rpm square) / 3000 rpm. The plastic pipette was used for transferring plasma into a plastic tube. The blood was centrifuged to obtain the plasma with low platelet level around 1500 g’s for 30 minutes. The plasma was stored at room temperature until the testing process. The complete test was performed in 3 hours in an aggregometer

HYPERBARIC OXYGEN EXPOSURE
The sample determination was performed by using a ballot. Before the treatment, the subjects filled the agreement form and questionnaire. The subjects who have been fulfilled the inclusion criteria, undergone all the examination, stated an agreement to be a subject in this study were randomized based on the random number. The control group (NONB) subject were treated with normobaric normocytic condition (20% O2 1 ATA) for 90 minutes and treatment group (HBOT) were treated with hyperoxic hyperbaric condition (100% O2 2.4 ATA) for 3 x 30 minutes with interval of 2 x 5 minutes for inhaling fresh air.

RESULTS
There was decrease in the platelet aggregation percentage in the Hyperoxia hyperbaric Oxygen Chamber (HBOT) Group after going out from High Pressure Chamber (HPC) on the fifth day compared to the platelet aggregation percentage on the initial day before going in the on the first day, which was from 76.56 ± 8.06 to 69.13 ± 6.03. The NONB Group showed an increase in the platelet aggregation percentage on the fifth day compared to the platelet aggregation percentage on the first day, which was from 73.94 ± 9.45 to 70.44 ± 9.86. The decrease on the platelet aggregation speed, aggregation index, and aggregation percentage after the exposure of 5-days HBOT could decrease the latency time, aggregation speed, aggregation index, and aggregation percentage of thrombocyte. La Croix stated that the exposure of HBOT 100% O2 3 x 30 minutes with an interval of 3 x 5 minutes of inhaling fresh air for five days could decrease Adenosine Diphosphate (ADP) and collagen which was an aggregator (platelet aggregation trigger). Reactive Oxygen Species caused a concentration–dependent inhibition of Whole Blood Aggregation (WBA) in blood. While diabetes Mellitus could decrease the production and action of NO, HBOT can inhibit platelet aggregation through c-GMP mechanism.

DISCUSSION
HBOT 100% O2 3 x 30 minutes with an interval of 5 minutes for inhaling fresh air for five days on the patients with NIDDM could decrease the latency time, aggregation speed, aggregation index, and aggregation percentage of thrombocyte. The use of HBOT 2.4 ATA 100% O2 3 x 30 minutes, once a day, for five days continuously could decrease the aggregation parameters (latency time, aggregation, speed, aggregation index, and aggregation percentage) of plateletin patients with NIDDM.

CONCLUSION

REFERENCES
5. Harald H H W Schmidt, Franz Hofmann, Johannes-Peter Stasch, cGMP and cGMP-Dependent Protein Kinase in Platelets and Blood Cells. cGMP: Generators, Effectors and Therapeutic Implications. Springer, 533–548