Regulasi Inflamasi pada Nelayan Tradisional Penyelam Bebas Kabupaten Maluku Tenggara: Kajian pada HIF-1, NF-B dan Produksi Sitokin = Regulation of Inflammation in Traditional Fishermen Freediver in Southeast Maluku Regency: Study on HIF-1, NF-B, and Cytokines Production

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Abstrak

Praktik menyelam bebas yang dilakukan oleh nelayan tradisional Indonesia dihadapkan pada kondisi lingkungan ekstrim yang mengakibatkan hipoksia dan stress oksidatif yang dapat memicu terjadinya inflamasi. Proses inflamasi berhubungan dengan aktivasi jalur pensinyalan NF-B yang meregulasi gen-gen sitokin proinflamasi, sedangkan respons seluler terhadap rendahnya kadar oksigen pada hipoksia melibatkan HIF sebagai regulator utamanya. Penelitian ini bertujuan untuk menganalisis ekspresi mRNA HIF-1, NF-B, sitokin proinflamasi dan antiinflamasi pada nelayan penyelam bebas serta kontrol non penyelam yang berasal dari Provinsi Maluku. Studi cross-sectional dilakukan dengan pengujian sitokin TNF-, IL-6 dan IL-10 dari plasma menggunakan sandwich ELISA serta isolasi RNA dari darah lengkap untuk analisis ekspresi mRNA HIF-1 dan NF-B menggunakan RT-qPCR. Data hasil penelitian diuji normalitas menggunakan uji Shapiro-Wilk, dilanjutkan uji independent T-test untuk data terdistribusi normal dan uji Mann Whitney untuk data tidak terdistribusi normal. Analisis korelasi antara ekspresi mRNA HIF-1 dan NF-B dengan profil sitokin menggunakan uji korelasi Pearson untuk data yang terdistribusi normal atau Rank Spearman untuk data yang tidak terdistribusi normal. Hasil penelitian menunjukkan tidak terdapat perbedaan yang signifikan dari ekspresi mRNA HIF-1 maupun NF-B serta kadar TNF- pada nelayan penyelam bebas dibandingkan dengan kontrol non penyelam. Namun, terdapat perbedaan yang signifikan dari kadar IL-6 dan IL-10 antara nelayan penyelam bebas dengan kontrol non penyelam ($p< 0,05$). Tidak terdapat korelasi antara ekspresi mRNA HIF-1 dan NF-B terhadap sitokin TNF-, IL-6 dan IL-10. Kesimpulan dari penelitian ini terjadi peningkatan ekspresi mRNA HIF-1, NF-B serta kadar sitokin TNF-, IL-6 dan IL-10 secara seluler, tetapi masih dalam rentang respon fisiologisnya.

.....Breath-hold diving or freediving in Traditional Indonesian fishermen, is faced with extreme environmental conditions that result in hypoxia and oxidative stress, which can trigger inflammation. The inflammatory process is associated with the activation of the NF-B signaling pathway, which regulates proinflammatory cytokine genes, while the cellular response to low oxygen levels in hypoxia involves HIF as the main regulator. The aim of this study was to analyze the mRNA expression of HIF-1, NF-B, and pro/anti-inflammatory cytokines in freediving fishermen and non-divers from Maluku Province. The study used a cross-sectional design. Blood samples were obtained from both subjects. The blood plasma samples were used to quantify TNF-, IL-6, and IL-10 by using ELISA. RNA isolation from whole blood specimen was carried out for analysis of HIF-1 and NF-B mRNA expression using RT-qPCR. The data were analyzed for normality using the Shapiro-Wilk test if the data was normally distributed, followed by the parametric independent T-test; otherwise, the Mann-Whitney non-parametric test was used. Correlation study of HIF-1 and NF-B mRNA expression with pro-inflammatory and anti-inflammatory cytokine profiles in freedivers and non-diver controls was performed using the Pearson correlation test for normally distributed data or

Spearman's Rank for non-normal distribution. There were no significant differences observed in the expression of HIF-1 and NF-B in freediving fishermen and nondivers, as well as no significant differences in the TNF- levels among freediving fishermen and non-divers. Both IL-6 and IL-10 are elevated markedly ($p<0.05$) in freediving fishermen when compared with non-divers. There was no correlation between HIF-1, NF-B expression and TNF-, IL-6, IL-10. The conclusion of this study is that although there was an increase in several parameters, both HIF-1 and NF-B mRNA expression, as well as pro-inflammatory (TNF-, IL-6) and antiinflammatory (IL-10) cytokines at the cellular level, were still within the range of physiological responses.