A STUDY OF SEMEN PARAMETERS IN WELDERS AND NON-WELDERS IN THE SRI LANKA NAVY

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Degree of Master of Engineering

Department of Mechanical Engineering

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the Degree Master of Engineering in Mechanical Engineering

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Declaration

This report contains no material which has been accepted for the award of any other degree or diploma in any University or equivalent institution in Sri Lanka or abroad, and that to the best of my knowledge and belief, contains no material previously published or written by any other person, except where due reference is made in the text of this report.

I carried out the work described in this report under the supervision of Dr. H.K.G. Punchihewa from the department of Mechanical Engineering, University of Moratuwa and Prof (Mrs.). D.M.S. Fernando from the Department of Health Science, Faculty of Medical Sciences, University of Sri Jayewardenepura

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Dedication

This thesis work is dedicated to my parents, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

This work is also dedicated to my wife, Nayana, who has been a constant source of support and encouragement throughout this research. I am truly thankful for having you in my life.

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Abstract

Introduction: Welding is a metal joining process widely used in fabrication industry worldwide. Welding emissions are known to cause adverse effects on male reproductive system. The degree of hazard depends on the composition, concentration, and the length of exposure to emissions. Sri Lanka Navy has more than 300 welders at key establishments but their fertility status has not been assessed.

Objectives: The objective of this study was to describe the socio-demographic and lifestyle factors of welders and non-welders, and to describe the occupational exposures of welders of Sri Lanka Navy working in Colombo. The lifestyle factors, occupational factors and sperm parameters of welders and non-welders were compared.

Methodology: A descriptive study was done with welders (n=44) and non-welders (n=44) of Sri Lanka Navy base in Colombo. Socio-demographic and lifestyle factors of both groups and occupational factors of welders were studied. Semen samples were obtained from welders and non-welders after informed consent. Semen fluid analysis (SFA) was performed according to guidelines of WHO (2010), at Naval General Hospital Colombo and sperm parameters were compared in welders and non-welders. Correlation between lifestyle and occupational factors, and sperm parameters of welders were assessed. Ethical clearance was obtained from the Faculty of Medicine, Kothelawela defense University.

Results: The socio-demographic characters and lifestyle factors of both welders and non-welders were similar. Welders working in shipyard /on board ships were more exposed to welding emissions than those welders in fabrication workshop. The sperm parameters were normal in 70% of welders when compared to 86% for non-welders. Among welders sperm concentration was abnormal in 16% and sperm motility was abnormal in 11%. In contrast only 7% of non-welders had abnormal sperm concentration and motility was normal in all of them. Although the dose of exposure (hours/day) to welding emissions did not have a significant effect on sperm parameters of welders, the total duration of exposure (number of years of exposure) had a significant effect on sperm concentration of welders ($r = -0.4$ $p = 0.007$). Squatting position and wearing synthetic underpants had a significant association with sperm concentration of welders.

Conclusion: In this study the socio demographic and life style factors among welders and non-welders of the SLN base in Colombo were similar. Long term exposure to welding emission had a significant effect on sperm concentration but there were no effects with short duration of exposure. Welding in squatting position and wearing of dark coloured synthetic underpants was associated with a lower sperm concentration in welders.

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Abbreviations		Description
BDCP	-	Deibromochloropropane
BMI	-	Body Mass Index
BTB	-	Blood Testis Barrier
CAVID	-	Congenital Absence of Vas Deferens
EDB	-	Ethylenedibromide
EMF	-	Electromagnetic field
FSH	-	Follicle Stimulating Hormone
GnRH	-	Gonadotropin Hormone-Releasing Hormone
GMAW	-	Gas Metal Arc Welding
IM	-	Immortality
LH	-	Luteinizing hormone
MIG	-	Metal Inert Gas Welding
NP	-	Non-progressive
SLN	-	Sri Lanka Navy
SLNS	-	Sri Lanka Naval Ship
SMAW	-	Shielded Metal Arc Welding
TCE	-	Trichloroethylene
THC	-	Tetrahydrocannabinol
TIG	-	Tungsten Inert Gas Welding
PCE	-	Perchloroethylene
PER	-	Tetrachloroethylene
PPE	-	Personal Protective Equipment

PR	-	Progressive
SAR	-	Specific Absorption Rate
SFA	-	Semen Fluid Analysis
SMAW	-	Shielded Metal Arc Welding
WHO	-	World Health Organization

LIST OF APPENDICES