

UNIVERSITI TEKNOLOGI MARA

**POTENTIAL HEAVY METAL HEALTH RISK VIA
CONSUMPTION OF *Rastrelliger kanagurta* FROM
SELECTED WET MARKETS IN HULU LANGAT
DISTRICT**

ASYHMAN JOHANN BIN JALALUDIN

Project submitted in fulfillment of the requirements for
the degree of
**Bachelor in Environmental Health and Safety
(Hons.)**

Faculty of Health Sciences

January 2023

ACKNOWLEDGEMENT

In the name of Allah, The Most Gracious, The Most Merciful.

Assalamualaikum and Alhamdulillah, all praise to Allah S.W.T The Supreme Lord of the Universe. Peace and blessing to Prophet Muhammad S.A.W., all prophets and their families. I praise Allah S.W.T. for the strength and His blessings in completing my study.

Thousands of thanks and love to my parents Mr. Jalaludin Bin Omar and
for their support and encouragement through thick and thin of my study. Next, I also want to thank both of my sisters, Amal Jaune binti Jalaludin and Ajeerah Jawaher binti Jalaludin who support me during this degree journey. My deepest gratitude and appreciation to my dearest supervisor, Dr. Siti Norashikin binti Mohamad Shaifudin who spent her time and efforts in guiding and advising from the beginning till the end of my research journey. Not to forget, I would like to thank all the lecturers in Department of Environmental Health and Safety, Faculty of Health Sciences who always share their thoughts, knowledge and advice throughout my study in UiTM Puncak Alam. Only God can reward all of you with goodness.

My sincere thanks and appreciation also goes to all the staff from the department and laboratory who gave their full cooperation and assisted me in many ways throughout my study. A special thanks to my friends from HS243 who always give me support and motivation while completing my study. May our friendship last forever. Lastly, I would like to thank everyone who involved directly and indirectly in this study. Thank You.

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ABSTRACT

Due to its remarkable nutritional properties, fish especially Indian Mackerel (*Rastrelliger kanagurta*) is regarded as an important source of a healthy, well-balanced diet. However, anthropogenic environmental impacts have contributed to a significant increase in the amount of naturally occurring heavy metals in the environment, notably in the marine ecosystem. The fact that marine species like fish can accumulate these metals to potentially toxic concentrations is concerning since food containing toxic metals above permitted levels considered harmful to human health. Therefore, the aim of this study was to determine the concentration of heavy metals (chromium, cadmium, copper and zinc) in *R. kanagurta* and to calculate potential health risk based on previously estimated fish intake among adult and children population in Malaysia. 15 samples of *R. kanagurta* were collected from Bandar Baru Bangi wet market, Kajang wet market and Semenyih wet market which are located in Hulu Langat district. The concentration of heavy metals was measured using Atomic Absorption Spectroscopy (AAS) (Perkin Elmer). The concentration of heavy metals was found to vary and in order of $Zn > Cu > Cr > Cd$ in all samples. All the heavy metals were within the permitted level of the FAO, WHO, and Malaysian Food Act 1983. Further statistical analysis using Kruskal-Wallis test revealed that only mean concentration of cadmium and zinc were significantly different from different wet markets ($p < 0.05$). For the health risk assessment, formula of THQ and TCR were used to calculate the non-carcinogenic risk and carcinogenic risk respectively. The cumulative effect of all metals in this study was found not to exceed the value of 1 for THQ in all samples for adult and children ($THQ < 1$), which indicates that non-carcinogenic health effects are not expected to occur. However, the TCR value for adult and child were found to be exceeding 10^{-6} of acceptable TCR value which may present with carcinogenic risk to consumers. Therefore, it can be concluded that consuming *R. kanagurta* species from wet markets in Hulu Langat district presently poses carcinogenic health risks to humans. Therefore, it is suggested that regular heavy metals surveillance of marine fish should be carried out by environmental health authorities to ensure that the metal content does not exceed the set standards. For the future studies, as HMs are the only focus of pollutant in the study, it is recommended that other pollutants such as pesticides, insecticides, or micro plastics to be analysed which are also known to be accumulated in fish and possess health risk to human.

Keywords: *Fish, Heavy Metals, Rastrelliger kanagurta, Target Hazard Quotient(THQ), Target Cancer Risk (TCR)*

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Fish is one of the important sources of protein as it supplies 21% of the total protein for consumers in Malaysia. Fish like *R. kanagurta* is popular because it does not only provide protein, but also contains various of minerals, vitamins and polyunsaturated omega-3 fatty acids which able to lower the risk of cardiovascular diseases and some types of cancer (Zhu et al., 2015). Based on NCCFN (2021), it is advisable to take 1 serving of fish daily. It is estimated that at least 52.2 kg of annual fish consumption per person which is the highest in Southeast Asia (Ahmad et al., 2016). Fish is popular because it does not only provide protein, but also contains various of minerals, vitamins and polyunsaturated omega-3 fatty acids which able to lower the risk of cardiovascular diseases and some types of cancer (Zhu et al., 2015). However, environmental pollution is becoming more serious in some coastal areas and estuaries with rapid industrial development. These activities have significantly increased the amount of heavy metals (HMs) that naturally occur in the environment, particularly the marine ecology. Worryingly, marine organisms like fish may store these pollutants in their muscle tissue and pose a risk to human health, especially high consumers. Marine organisms including fish can accumulate these contaminants in their muscle tissue and pose a potential health risk (Bosch et.al, 2016; Han et al., 2021).

Heavy metals (HMs) have been considered as a serious global environmental threat (Han et al., 2021). The most common HMs found in aquatic environment include cadmium (Cd), nickel (Ni), zinc (Zn) and copper (Cu) (Azizi et al., 2018). These contaminants are concerning because of their difficulty in degrading and high potential for bioaccumulation in the aquatic environment These contaminants are problematic because they do not degrade easily and have a high potential for bioaccumulation in the aquatic environment (Chen & Chau, 2016). Consequently, marine fish can absorb toxic metals not only through the surrounding water and sediments, but also through