

# An exploratory study on risk factors for chronic non-communicable diseases among adolescents in Malaysia: overview of the Malaysian Health and Adolescents Longitudinal Research Team study (The MyHeART study)

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## Abstract

**Background:** The National Health & Morbidity Survey (NHMS) IV (2011) observed that the prevalence of obese children aged less than 18 years in Malaysia is 6.1% compared to 5.4% overweight and obese in NHMS III (2006). As such, this observation is of public health importance as obesity is a forewarning risk factor for chronic diseases such as type-2 diabetes, cardiovascular diseases (CVD) and certain types of cancers. This MyHeART (Malaysian Health and Adolescents longitudinal Research Team) study aims to examine risk factors of non-communicable diseases (NCD) among adolescents.

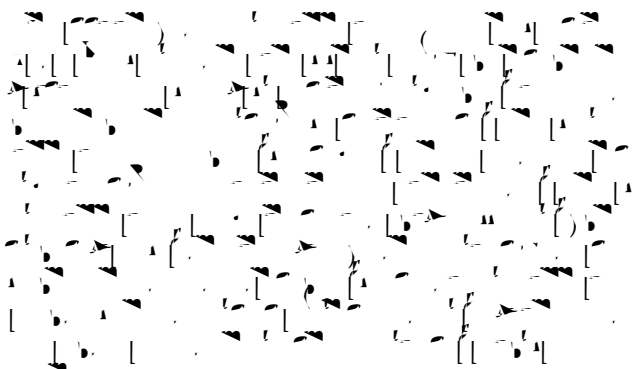
**Methods/design:** The MyHeART study is longitudinal cohort study of 1361 schoolchildren (13-years old) attending 15 public secondary schools from the central (Kuala Lumpur and Selangor) and northern (Perak) regions of Peninsular Malaysia. The study used a stratified sampling design to select the study participants. Data collected at baseline included socio-economic, lifestyle (e.g. smoking, physical activity assessment, fitness assessment, seven-day diet history), and environmental information, anthropometric measurements, blood pressure, handgrip strength and bone mineral density. Blood samples for fasting blood glucose and lipid profiles, full blood count, renal profile, as well as bone profile and serum vitamin D were taken. This study cohort will be followed up again when participants turn 15, 17 and lastly, after a period of ten years (around the age of 27).

**Results:** Nine percent of the adolescents from this study were obese. More male participants smoked compared to female participants (15.4% vs. 4.7%). Adolescent males had higher fasting blood glucose but the female participants had lower high density lipoprotein (HDL-cholesterol) and higher low density lipoprotein (LDL-cholesterol). In addition, adolescents from the rural area had higher fasting blood glucose, diastolic blood pressure, total cholesterol and LDL-cholesterol.

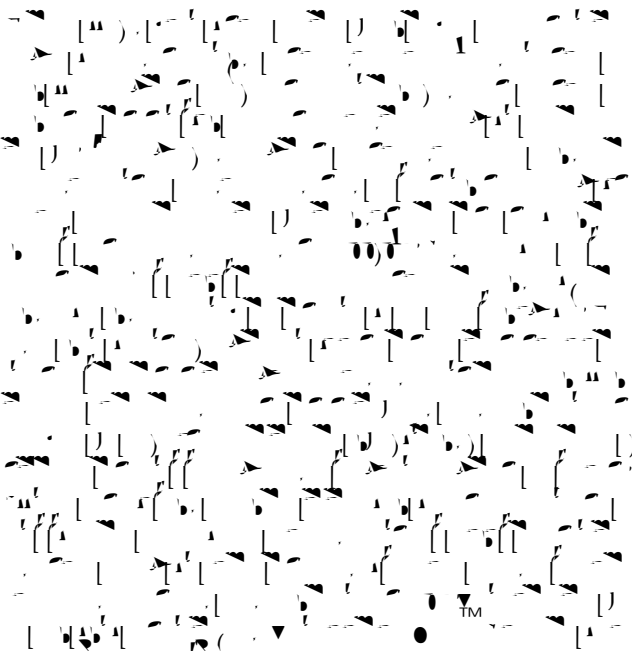
**Discussion:** Our results demonstrated that adolescents from the rural area are at higher risk of NCDs compared to their urban counterpart. Tailor made public health interventions are highly recommended for adolescents as this may

Background

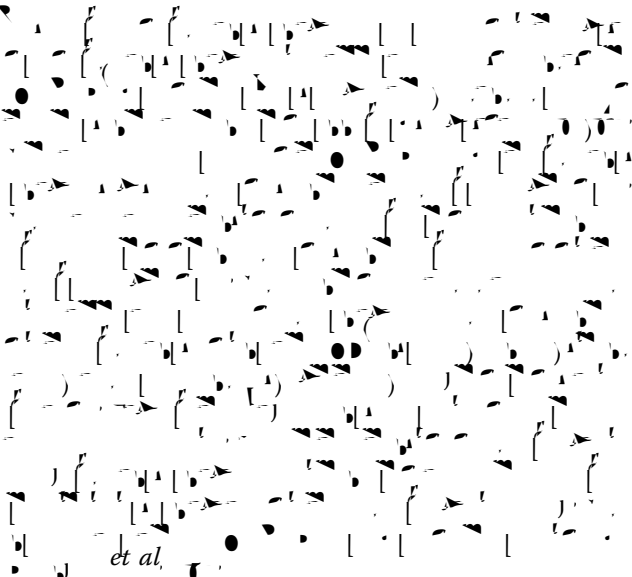
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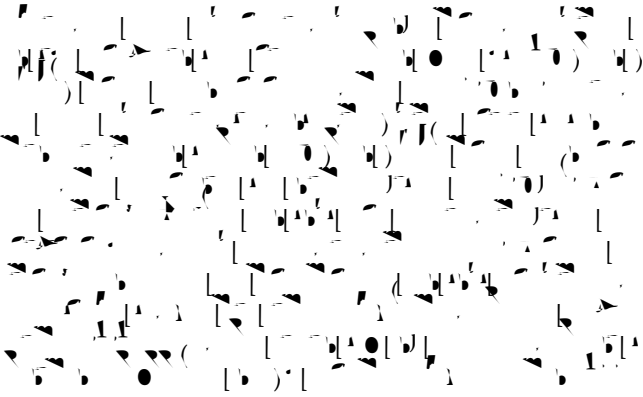
**Dietary assessment**



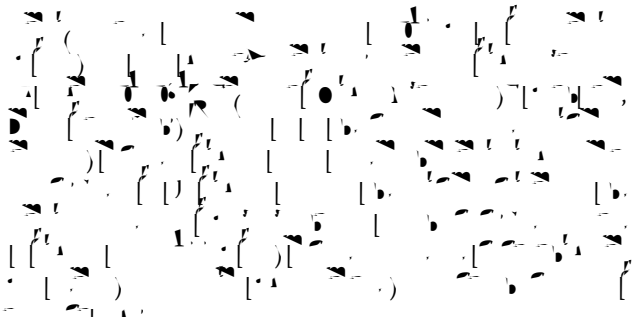
**Physical activity**



**Physical evaluation**



*et al.*



**Blood profile**

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The text outlines the various methods used to collect and analyze data, including the use of computerized systems and manual audits. It also highlights the need for transparency and accountability in the reporting process.

2. The second part of the document focuses on the role of the regulatory body in overseeing the financial industry. It describes the various functions of the regulator, including monitoring market activity, enforcing rules, and providing guidance to market participants. The text also discusses the challenges faced by the regulator in a rapidly changing market environment and the need for ongoing collaboration and communication with industry stakeholders.

3. The third part of the document addresses the issue of risk management in the financial industry. It explains the various types of risks that can arise, such as credit risk, market risk, and operational risk, and the importance of identifying and measuring these risks. The text also discusses the various strategies used to manage risk, including the use of derivatives and other financial instruments, and the need for a comprehensive risk management framework.

4. The fourth part of the document discusses the importance of investor protection in the financial industry. It explains the various ways in which investors can be protected, including the use of disclosure requirements, investor education, and the establishment of investor compensation schemes. The text also discusses the challenges faced by investors in a complex and volatile market environment and the need for ongoing monitoring and support.

5. The fifth part of the document discusses the importance of financial stability in the financial industry. It explains the various factors that can contribute to financial instability, such as excessive leverage, asset price bubbles, and systemic risk. The text also discusses the various measures that can be taken to promote financial stability, including the use of prudential supervision, macroprudential measures, and the establishment of financial safety nets.

6. The sixth part of the document discusses the importance of financial inclusion in the financial industry. It explains the various barriers to financial inclusion, such as lack of access to financial services, low financial literacy, and high transaction costs. The text also discusses the various measures that can be taken to promote financial inclusion, including the use of innovative financial products, the establishment of financial education programs, and the implementation of regulatory measures to reduce barriers to access.

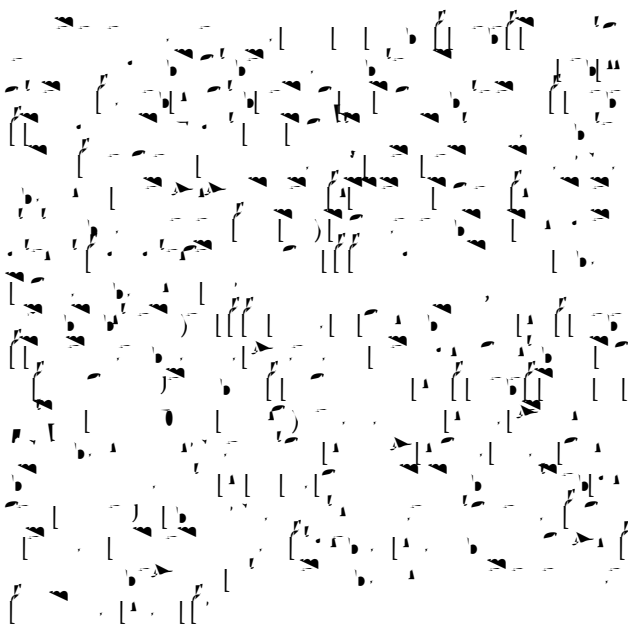
7. The seventh part of the document discusses the importance of financial innovation in the financial industry. It explains the various types of financial innovation, such as fintech, blockchain, and artificial intelligence, and the potential benefits of these technologies. The text also discusses the challenges faced by financial innovators in a highly regulated and competitive market environment and the need for ongoing collaboration and communication with regulatory bodies.

8. The eighth part of the document discusses the importance of financial reform in the financial industry. It explains the various areas of reform, such as strengthening prudential supervision, improving market infrastructure, and enhancing investor protection. The text also discusses the challenges faced by reformers in a complex and volatile market environment and the need for ongoing monitoring and support.

9. The ninth part of the document discusses the importance of financial cooperation in the financial industry. It explains the various ways in which financial institutions can cooperate, including the use of industry associations, the establishment of cross-industry working groups, and the implementation of international standards. The text also discusses the challenges faced by financial institutions in a globalized market environment and the need for ongoing collaboration and communication with international partners.

10. The tenth part of the document discusses the importance of financial resilience in the financial industry. It explains the various factors that can contribute to financial resilience, such as strong capital positions, diversified portfolios, and robust risk management frameworks. The text also discusses the challenges faced by financial institutions in a highly volatile and uncertain market environment and the need for ongoing monitoring and support.





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#### Competing interests

The authors declare that they have no competing interests.

#### Authors' contributions

All authors contribute to the study design; MAH, MYJ, NAS and TTS were involved in the field work and data collection. MAH was responsible for the drafting of this manuscript and all authors approved the final manuscript.

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