

ORIGINAL ARTICLE

The Socioecological Determinants of Screen Time Among Preschoolers with Excess Weight in Malaysia: A Cross Sectional Study

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ABSTRACT

Introduction: Excessive body weight is a growing concern affecting not only adults but also children, with a strong association between screen time and excessive weight has been reported. Through the application of the socio-ecological model, this study aimed to determine the prevalence and factors associated with screen time among the KEMAS preschool children with excess weight in Johor Bahru, Johor. **Materials and methods:** A cross-sectional study was conducted using multistage cluster random sampling among parent-child dyads from all KEMAS preschools in Johor Bahru. Data was collected in May 2023 using a pre-tested self-administered questionnaire distributed to the parents through the teachers. Three levels of analysis were done using IBM SPSS version 28.0. **Results:** A total of 239 eligible parent-child dyads were sampled, with 84.9% of the children having screen time of more than two hours. Preschoolers with employed parents (AOR=2.362, 95% CI: 1.073-5.200), parental screen time of more than two hours (AOR=3.503, 95% CI: 1.595-7.698), have television at home (AOR=8.054, 95% CI: 2.278-28.478) and presence of handheld devices at home (AOR=6.087, 95% CI: 1.811-20.451) were having 2.36, 3.50, 8.05 and 6.09 higher odds towards excess screen time. **Conclusion:** The study reflects a high prevalence of screen time of more than two hours per day among preschoolers with excess weight, which can be determined by their parental employment status, parental screen time, and types of screen present at home. Future initiatives to limit screen time in preschooler with excess weight should consider these aspects for better outcomes.

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INTRODUCTION

Excessive weight, which includes overweight and obesity, has become another spectrum of malnutrition, in addition to stunting and wasting. According to the World Health Organization (WHO), overweight and obesity are defined as abnormal or excessive fat accumulation that poses a risk to health (1). It is especially concerning that the rising prevalence of excessive weight affects not only adults but also children. Nearly five decades ago, 4.0% of children aged 5-19 years worldwide had excessive weight, but by 2016 this figure had risen to 20.0% (1). In Malaysia, the prevalence of childhood obesity among children aged 5-17 years rose from 6.1% in 2011 to 14.8% over a decade, indicating that Malaysia is also affected by this global epidemic (2).

Globally, between 70% and 90% of children under

five fail to adhere to the recommended screen time limits, particularly in developed countries (3). In Malaysia, according to the older American Academy of Paediatrics (1999) guidelines, more than half (52.2%) of children under five surpassed the two-hour screen time limit, with 74% of children under two years old and 32.6% of those aged between two and five years, as reported in the 2016 National Health and Morbidity Survey (NHMS) (4). Excessive screen time has been associated with language delays, physical inactivity, childhood obesity, socioemotional development issues, and neurodevelopmental challenges, which can lead to poorer educational performance and hinder children's ability to explore their creativity and engage with their surroundings (3). In addition, studies have also shown that children who are overweight or obese tend to spend more time in front of screens. (5). However, there is a limited number of studies that examine the factors affecting screen time among these children.

Multiple factors have been associated with increased screen time among children. These include the child's age, gender, ethnicity, and parent's age, all of which can

influence screen time. Additionally, the children's level of physical activity and environmental factors, such as the number and types of screens available at home, also influence children's screen time (8, 9). Moreover, as children's activities and behaviours are heavily influenced by their parent's actions and parenting practices, considerable research has highlighted the association between the parent's self-efficacy in managing the children's activities, parents' screen time and children's screen time (3, 8-10).

Preschool age is a crucial period for the development of a child's social, emotional, and cognitive functions (11). During this age, children begin to recognise their skills and capabilities while learning to adapt to their surroundings (12). Due to rapid brain development at this age, healthy habits formed during this time are more likely to persist throughout life (13). Behavioural problems that emerge during this stage are often stable and typically continue as the child enters school and beyond (14). Therefore, understanding the factors associated with increased screen time exposure among preschoolers could be the key component in a childhood obesity prevention program in the future.

Given that various factors can influence children's screen time, a comprehensive framework is needed to describe these factors in a more systematic manner. The Socioecological Model (SEM) offers a comprehensive framework examining the interaction of various layers of influence on human behaviour. Because of this, SEM is the most suitable framework for understanding the various factors that can affect children's screen time at various levels (15). Therefore, utilising SEM, this study aimed to determine the prevalence and factors associated with increased screen time among the KEMAS preschoolers with excess weight in Johor Bahru, Johor, Malaysia.

MATERIALS AND METHODS

Study sample

This cross-sectional study was conducted in the Johor Bahru district in the state of Johor, Malaysia. Data was collected in one month in May 2023 from parents who understand Malay and have children aged five and six years old with excess weight (BMI-for-age exceeds one standard deviation from the WHO Growth Reference 2007) attending KEMAS preschool in the district. Data was collected from a single available parent in each family during the data collection period. Parent-child dyads that did not have any type of screens available at home were not included in the study. Approval from the University Putra Malaysia's Ethic Committee for Research Involving Human Subject was obtained prior to data collection (Reference number: JKEUPM-2023-175).

The parent-child dyad was recruited using multistage cluster random sampling. The list of the district's parliament areas serves as the primary sampling frame,

the list of preschools as the secondary sampling frame and the parent-child dyad as the tertiary sampling frame. Four out of five parliamentary areas in Johor Bahru were selected using a random number generator. Next, all preschools within these selected parliamentary areas were included as the secondary sampling frame, resulting in a total of 96 preschools. Finally, with an estimated 360 parent-child with excess weight dyads, all eligible parent-child dyads from the selected preschools were selected from the tertiary sampling frame.

The sample size for this study was determined based on a proportion formula using data from a similar study in China (16) and resulted in an initial estimate of 204 respondents. After adjusting for the population size based on finite population correction (17), accounting for potential non-responses, and adding the design effect of two, the final sample size for the study was refined to 288 participants.

Preschoolers with excess weight were identified through anthropometry data collected by the school health team in March, which was obtained from the teachers. Based on medical records from the teachers, children with underlying medical disorders that might lead to excess weight were excluded from this study. Questionnaires were distributed to the parents through the teachers when they picked up their children from school. Respondents with incomplete responses were contacted by the teachers to get the information needed.

Dependent variable

The screen time of the preschoolers was determined based on a previous study in Malaysia by Raj et al. (3), which was adapted from Bernard et al (18). The respondents were asked to state the average time spent by the child on each type of screen (television, computers/laptops, and handheld devices) in hours and minutes during weekdays and weekends. The screen time for each specific type of screen was summed in minutes and averaged using the following formula: $[(\text{weekday screen time in minutes} \times 5 + \text{weekend screen time in minutes} \times 2)/7]$. The total amount of a child's screen time was determined by summing together hours spent using each of the three screen types and was categorised into two hours or less or more than two hours according to the Malaysian Dietary Guidelines for Children and Adolescents-Summary 2013 (19).

Independent variable

Intrapersonal factors, namely the child's age, gender, and ethnicity, were derived from prior research (3). The assessment of preschoolers' weekly physical activity frequency during their leisure time was adapted from a prior study conducted by Mohd Zaki et al. (20). Subsequently, the physical activity data were categorised into less than three times a week and three times a week or more (21).

For the interpersonal factors, the parent's age, education level, employment status, household income, and screen time were adapted from the previous study by Raj et al. (3). The household income was categorised into two groups based on the poverty line in Johor (RM2,505) which are above poverty line (RM2,505 and above) and below poverty line (less than RM2505) (22). The parent's self-efficacy is the respondent's confidence in influencing their child's physical activity level, ranging from 1, which is not confident, to 5, which is very confident. The score was summed up and classified into low (less than 25th percentile), moderate (25th to less than 75th percentile) and high (75th percentile and above) (3, 23). For the presence of siblings, the number of children the respondent has, other than the child included in the study, was assessed and categorised into yes (number of children two or more) and no (number of children 1).

For household factors, parents were asked about rules or regulations regarding the time limitation of a child's screen time as yes, no, and unsure (7). The number and type of screens were also assessed by the total number of devices with screens that are available at home, which were mainly used for entertainment, such as television, computers, and handheld devices. The total number of screens was classified into less than three screens and three or more screens, while each type of screen was grouped into yes (one or more specified screens were present) and no (zero number of specified screens were present) (3, 18, 24).

The community factors include the availability of outdoor play areas, neighbourhood crime safety and pedestrian walking safety. Information on the availability of public facilities such as parks or playgrounds where the respondent child can play and be physically active was obtained from parents to assess the availability of outdoor play areas (3, 25). Crime safety and pedestrian walking safety were assessed using questionnaires adapted from Raj et al. and Prado et al., which were adapted from the Neighbourhood Environment Walkability Scale (NEWS) (3, 26). The responses ranged from 1 (strongly disagree) to 5 (strongly agree), with the higher score indicating lower levels of safety for both crime and pedestrian walking.

The validity of the questionnaire was assessed through content and face validity. The questionnaire's reliability was assessed using the Cronbach alpha coefficient value

for numerical questions, and Cohen kappa's agreement value was used for categorical questions. The Cronbach alpha coefficient value ranged from 0.71 to 0.88, while the Cohen kappa's agreement value ranged from 0.80 to 0.94.

Statistical analysis

Data analysis was conducted using SPSS 28.0 for Windows. Descriptive analysis was employed to provide an overview of the respondents' background characteristics, which were described as number and percentage, mean and standard deviation (SD) or median and interquartile range. To assess associations between dependent and independent variables, the Chi-square test was utilised, and Fisher's exact test was employed when more than 20% of cells had expected values below five. Independent t-test were conducted to evaluate mean differences for normally distributed continuous variables, while non-normally distributed variables were analysed using the Mann-Whitney U test. Multiple logistic regression analysis was performed to identify factors associated with screen time among KEMAS preschoolers with excess weight. All statistical tests were two-sided, and statistical significance was determined at a p-value threshold of less than 0.05.

RESULTS

Prevalence of screen time

Out of 290 parent-child dyads from 96 preschools that were approached, only 239 parents from 88 preschools actively participated and completed the questionnaire, resulting in an overall response rate of 82.4 %. The remaining 17.6% of parents refused to participate and did not return the questionnaire.

The findings of this study revealed that the median (IQR) screen time of the children was 19.4 (20.90) hours per day, with 15.1% of the children having a screen time of two hours or less per day and a majority of 84.9% reported having a screen time exceeding two hours per day (Table I).

Table I: Prevalence of screen time among KEMAS preschoolers with excess weight in Johor Bahru (N=239)

Screen time	Frequency	Percentage (%)
Child's screen time \leq 2 hours/day	36	15.1
Child's screen time >2 hours/day	203	84.9

Characteristics of the respondents according to the socioecological model constructs

Table II is showing the distribution of the respondents according to the intrapersonal, interpersonal, organizational and community factors.

Table II: Distribution of the respondents according to the intrapersonal, interpersonal, household and community factors

Variables	Mean±SD/ Median (IQR)	Fre- quency	Percent- age (%)
Intrapersonal factors			
Child's age	6.0(1.00)		
5 years old		82	34.3
6 years old		157	65.7
Child's gender			
Boys		143	59.8
Girls		96	40.2
Child's ethnicity			
Malay		214	89.5
India		5	2.1
Others		20	8.4
Child's physical activity			
Little/no physical activity		50	20.9
1-2 times a week		96	40.2
3-4 times a week		54	22.6
5-6 times a week		17	7.1
≥7 times a week		22	9.2
Interpersonal factors			
Parent's age	36.3±6.68		
≤29 years old		27	11.3
30-39 years old		152	63.6
40-49 years old		51	21.3
50-59 years old		7	2.9
≥60 years old		2	0.8
Parent's education level			
No formal education		8	3.3
Primary school		11	4.6
Secondary school		178	74.5
Diploma or certificate		36	15.1
Degree		6	2.5
Parent's employment status			
Public sector		19	7.9
Private sector		115	48.1
Self-employed		27	11.3
Not working/Housewife		78	32.6
Household income (RM)	2000.0 (1500.00)		
Below poverty line		164	68.6
Above poverty line		75	31.4
Parent's screen time			
No screen time		5	2.1
<1 hour		7	2.9

CONTINUE

Table II: Distribution of the respondents according to the intrapersonal, interpersonal, household and community factor

Variables	Mean±SD/ Median (IQR)	Fre- quency	Percent- age (%)
Parent's screen time			
1-2 hours		68	28.5
3-5 hours		95	39.7
6-10 hours		33	13.8
11-14 hours		16	6.7
15-20 hours		6	2.5
>20 hours		9	3.8
Parent's self-efficacy	20.0(11.00)		
Low		69	28.9
Moderate		101	42.3
High		69	28.9
Presence of sibling			
Yes		195	81.6
No		44	18.4
Household factors			
Parent's marital status			
Married		224	93.7
Divorced/Widowed		11	4.6
Separated		4	1.7
Presence of household rules			
Yes		185	77.4
No		54	22.6
Number of screens			
1		12	5.0
2		40	16.7
3		69	28.9
4 or more		118	49.4
Television at home			
Yes		226	94.6
No		13	5.4
Computer at home			
Yes		56	23.4
No		183	76.6
Handheld devices at home			
Yes		226	94.6
No		13	5.4
Availability of outdoor play equipment			
Yes		206	86.2
No		33	13.8
Community factors			
Availability of outdoor play area			
Yes		177	74.1
No		62	25.9
Neighbourhood Crime safety	18.0(7.00)		
Neighbourhood Pedestrian safety	12.6±2.86		

a. Intrapersonal factors

The findings indicate that the median (IQR) age of these children was 6.0 (1.00) years. Most of the children, accounting for 65.7% of the respondents, were six years old, with the remaining 34.3% of children reported to be five years old. Boys contributed towards 59.8% of the total respondents, while girls accounted for only 40.2%. The majority were Malay, representing 89.6% of the respondents. A smaller percentage of 8.4% consisted of children from other ethnic backgrounds, including Iban, Kadazan, Dusun, Melanau, and Bajau. Additionally, children of Indian ethnicity constituted a minority group, comprising 2.1% of the respondents. Furthermore, 40.2% of these children had once or twice physical activity during their free time in the past one week, 22.6% had three to four times of physical activity, and 20.9% had little or no physical activity in the past one week. Only 9.2% had physical activities seven times or more in the past one week, while 7.1% had five to six times.

b. Interpersonal factors

Analysis of the data revealed that the mean \pm SD age of the parents was 36.3 ± 6.68 years, with the age range varying from the youngest parent at 22 years old to the oldest parent at 69 years old. Most of the parents were aged between 30-39 years old (63.6%), and 21.3% were aged 40-49 years. The majority had completed their education up to the secondary school level (74.5%), with a total of 15.1% of the parents holding a diploma or other certificate, while 4.6% had an education background limited to primary school. Interestingly, 3.3% of the parents did not have any formal education at all, and only a small percentage of the parents possessed a degree.

Meanwhile, the median (IQR) household income in the studied population was RM2000 (1500). The maximum household income was RM8000, and the lowest was RM500. Most respondents belonged to the household category below the poverty line, accounting for 68.6%. Nearly half of the respondents worked in the private sector, while 32.6% of the respondents were not working or housewives. 11.3% were self-employed, and only 7.9% worked in the public sector.

Interestingly, most parents had screen time of more than

two hours (66.5%), and only 33.5% had screen time of two hours or less. The median (IQR) score for parents' self-efficacy was 20.0 (11.00). Most of the parents had a moderate level of self-efficacy to control their child's physical activity (42.3%), and an equal proportion of the respondents had a high and low self-efficacy level, accounting for 28.9% each. Most of the children (81.6%) were found to have siblings at home.

c. Household factors

The study found that most respondents, comprising 93.7%, were married, while a small percentage reported being divorced, widowed (4.6%), or separated (1.7%). Furthermore, 77.4% of the participants indicated the presence of household rules regarding child screen time, but 22.6% did not have any rules on screen time. Nearly half of the respondents (49.4%) had four or more screens available at home, and only 5% had only one screen. Almost all the respondents have televisions or handheld devices at home (94.6%), but only 23.4% have computers. The majority of the respondents provided outdoor play equipment for their children (86.2%).

d. Community factors

The findings revealed that the majority of the respondents reported having an outdoor play area (74.1%) available in their neighbourhood for their children's use. Meanwhile, the parent's perception of the neighbourhood crime safety score had a median (IQR) of 18.0 (7.00), with the parent's perception of the neighbourhood pedestrian safety score having a mean \pm SD of 12.6 ± 2.86 .

Factors associated with screen time

The study identified several significant factors associated with screen time exceeding two hours among preschool children with excess weight (Table III). Interpersonal influences such as parents' employment status showed a significant association, with children with working parents having higher screen time than those whose parents were not employed ($p = 0.016$). Parental screen habits also correlated strongly, with children whose parents had screen time over two hours being more likely to exceed two hours of screen time themselves ($p < 0.001$). Sibling presence was another significant factor, with children with siblings displaying higher screen time than those without siblings ($p = 0.041$).

Table III: The association between screen time and the intrapersonal, interpersonal, household and community factors

Variables	Screen time n (%)		χ^2 (df)	p-value
	≤2 hours	>2 hours		
Intrapersonal factors				
Child's age				
5 years old	12 (14.6)	70 (85.4)	0.018 (1)	0.893
6 years old	24 (15.3)	133 (84.7)		
Child's gender				
Boys	25 (17.5)	118 (82.5)	1.629 (1)	0.202
Girls	11 (11.5)	85 (88.5)		
Child's ethnicity				
Malay	32 (15.0)	182 (85.0)		0.776 ^a
Non-Malay	4 (16.0)	21 (84.0)		
Child's physical activity				
<3 times/week	19 (13.0)	127 (87.0)	1.231 (1)	0.267
≥3 times/week	17 (18.3)	76 (81.7)		
Interpersonal factors				
Parent's age				
<30 years old	5 (18.5)	22 (81.5)		0.572 ^a
≥30 years old	31 (14.6)	181 (85.4)		
Parent's education level				
Low education	30 (15.2)	167 (84.8)	0.024(1)	0.877
High education	6 (14.3)	36 (85.7)		
Parent's employment status				
Working	18 (11.2)	143 (88.8)	5.813(1)	0.016*
Not working	18 (23.1)	60 (76.9)		
Household income				
Above poverty line	13 (13.3)	85 (86.7)	0.419(1)	0.517
Below poverty line	23 (16.3)	118 (83.7)		
Parent's screen time				
≤2 hours	22 (27.5)	58 (72.5)	14.539(1)	<0.001*
>2 hours	14 (8.8)	145 (91.2)		
Parent's self-efficacy				
Low	8 (11.6)	61 (88.4)	0.989(1)	0.610
Moderate	16 (15.8)	85 (84.2)		
High	12 (17.4)	57 (82.6)		
Presence of sibling				
Yes	25 (12.8)	170 (87.2)	4.162	0.041*
No	11 (25.0)	33 (75.0)		
Household factors				
Parent's marital status				
Married	33 (14.7)	191 (85.3)		0.479 ^a
Divorced/Widowed/ Separated	3 (20.0)	12 (80.0)		
Presence of household rules				
Yes	31 (16.8)	154 (83.2)	1.837 (1)	0.175
No	5 (9.3)	49 (90.7)		
Number of screens				
<3 screens	14 (26.9)	38 (73.1)	7.307(1)	0.007*
≥ 3 screens	22 (11.8)	165 (88.2)		

CONTINUE

Table III: The association between screen time and the intrapersonal, interpersonal, household and community factors (CONT.)

Variables	Screen time n (%)		χ^2 (df)	p-value
	≤2 hours	>2 hours		
Television at home				
Yes	29 (12.8)	197 (87.2)	16.163(1)	<0.001*
No	7 (53.8)	6 (46.2)		
Computer at home				
Yes	9 (16.1)	47 (83.9)	0.058(1)	0.809
No	27 (14.8)	156 (85.2)		
Handheld devices at home				
Yes	30 (13.3)	196 (86.7)	10.387(1)	0.001*
No	6 (46.2)	7 (53.8)		
Availability of outdoor play equipment				
Yes	29 (14.1)	177 (85.9)		0.297 ^a
No	7 (21.1)	26 (78.8)		
Community factors				
Availability of outdoor play area				
Yes	26 (14.7)	151 (85.3)	0.074(1)	0.785
No	10 (16.1)	52 (83.9)		

^a: Fisher's Exact Test
*significant p value <0.05

At the household level, children in homes with fewer than three screens were less likely to exceed two hours of screen time than those in homes with three or more screens ($p = 0.007$). Notably, the presence of a television ($p < 0.001$) and handheld devices ($p = 0.001$) in the home were both linked to higher screen time. Both the crime safety and pedestrian walking safety were found not to be significantly associated with the children's screen time (Table IV and Table V).

Table IV: Association between screen time and community factors using Mann-Whitney U Test (N=239).

Variables	Crime safety score, n	Median (IQR)	Z statistic	p-value
Children's screen time				
≤2 hours	36	17.0 (8.00)	-1.165	0.244
>2 hours	203	18.0 (6.00)		

Table V: Association between screen time and community factors using Independent T-Test (N=239).

Variables	Pedestrian walking safety score Mean±SD	Mean difference (95%CI)	t-value (df)	p-value
Children's screen time				
≤ 2 hours	12.4±2.89	-0.38 (-1.401-0.636)	0.740 (237)	0.460
>2 hours	12.7±2.85			

Determinants of screen time

Multiple logistic regression was conducted to identify the determinants of screen time exceeding two hours among KEMAS preschool children with excess weight in Johor Bahru. Children's gender, parent's employment status, parent's screen time, presence of siblings, presence of household rules, number of screens available at home, presence of TV at home, and presence of handheld

devices at home were eight variables that were found to have a p-value of less than 0.25 from the simple logistic regression. These variables were selected to be included in the multiple logistic regression analysis. The variables included in the final model are shown in Table VI.

Table VI: Determinants of screen time of more than two hours among KEMAS preschoolers with excess weight in Johor Bahru

Variable	Adjusted Coefficient	Standard error	Adjusted Odds ratio	95% CI for odds ratio		p-value
				Lower bound	Upper bound	
Parent's screen time						
≤2 hours	Ref	0.402	3.503	1.595	7.698	0.002
>2 hours	1.254					
Parent's employment status						
Working	0.859	0.403	2.362	1.073	5.200	0.033
Not working	Ref					
Television at home						
Yes	2.086	0.644	8.054	2.278	28.478	0.001
No	Ref					
Handheld devices at home						
Yes	1.806	0.618	6.087	1.811	20.451	0.003
No	Ref					
Intercept	-3.025	0.923	0.049			0.001

Significant $p < 0.05$, no multicollinearity, no interaction, Nagelkerke $R^2 = 0.239$, Cox and Snell $R^2 = 0.137$ Hosmer and Lemeshow $p = 0.937$, overall percentage 86.6% correctly classify, variable selection method: Forward Likelihood Ratio.

The final model was fit as evidenced by Hosmer and Lemeshow goodness of fit test ($\chi^2 = 0.813$, $df = 4$, $p = 0.937$). The logistic regression model achieved a Cox and Snell R-squared value of 13.7% and a Nagelkerke R-squared value of 23.9%, representing the proportion of explained variation by the model. A satisfactory overall

percentage of 86.6% was achieved in the classification table, with correct predictions made for the majority of the respondents.

The multiple logistic regression analysis revealed that parents with screen time of more than two hours have 3.503 higher odds of having children with screen time of more than two hours compared to parents who had screen time for two hours or less (AOR:3.503, 95% CI: 1.595-7.698). Children with working parents were also found to have 2.362 higher odds of having screen time for more than two hours than children with non-working parents (AOR = 2.362, 95% CI: 1.073-5.200). For types of screens available at home, children who have a TV at home were found to have 8.054 higher odds of having screen time more than two hours (AOR = 8.054, 95% CI: 2.278-28.478) and those who have handheld devices at home have 6.087 higher odds of having screen time more than two hours (AOR = 6.087, 95% CI: 1.811-20.451) compared to those children who did not have these screens at home.

Therefore, the final predictive model generated from the multiple logistic regression analysis is presented as follows:

Log (odds of screen time more than 2 hours) = (-3.025) +1.254 (parent's screen time more than 2 hours) +0.859 (parents working) +2.806 (presence of TV at home-yes) + 1.806 (presence of handheld device at home-yes).

DISCUSSION

Prevalence of screen time among preschoolers with excess weight

This study revealed almost 90% of the preschoolers, who were dominated from below-poverty-line households, were exposed to screen time of more than two hours. This percentage stands in stark contrast to earlier studies conducted in Malaysia, where the reported prevalence ranged from 25.0% to 27.0% (6, 27). However, these previous studies recruited preschoolers from both private and government preschools across Malaysia with diversified sociodemographic backgrounds.

Nevertheless, the prevalence obtained from this study is very similar to what had been reported in a separate study among a similar population conducted in Kuantan, Pahang, which revealed a similar prevalence of 89.9% of preschoolers, surpassing the two-hour screen time threshold (28). The high prevalence of excessive screen time observed in both studies could potentially be attributed to the fact that both cities serve as state capitals, providing better facilities and greater access to Information and Communication Technologies (ICTs). This enhanced availability and accessibility of technology might lead to increased screen time among preschoolers in these areas (29).

The high prevalence could also be attributed to the timing of data collection in May, which was just after the school holiday that ended on the 20th of April, 2023 (30). This timing could introduce recall bias as previous research has indicated that screen time tends to be significantly higher during school holidays compared to school terms (31). Furthermore, considering that most of the respondents were below the poverty line households, there is the possibility of a lack of parental monitoring due to economic commitments (32).

Determinants of screen time among preschoolers with excess weight

The current study found a significant association between parents' employment status and children's screen time. This finding aligned with a study conducted in Malaysia and China, which showed that children with non-working mothers had significantly lower screen time (33, 34). Children with working parents may have reduced time spent with their parents as they balance jobs, family, and other commitments (35). Specifically, in families with preschoolers, employed mothers have been found to allocate less time for various activities with their children (36). The reduction in parent-child interaction may lead children to seek alternative entertainment sources, increasing their screen time and replacing outdoor play with indoor passive sedentary activities (34, 37).

Consistent with prior research (3, 9, 38), the present study demonstrates a significant association between parental and child's screen time. This link may be due to the fact that children often acquire an understanding of the social and physical world through observing others' actions (39). Thus, how children allocate their time to screen activities could be strongly influenced by their parents' screen usage patterns (40). Supporting this, Ishii et al. found significant indirect effects of mothers' and fathers' screen time on children's BMI via children's weekday screen time (41). These results highlight that parental screen time can contribute to increased screen time in children, subsequently influencing weight outcomes. Furthermore, with 53.3% of parents still unaware of parental control options, children may be exposed to even more screen time, underscoring the need for greater parental awareness and involvement in managing screen exposure (42).

The current study also found that the presence of TVs and handheld devices at home was associated with increased screen time among children, consistent with previous studies (43-45). These studies suggest that the availability of these devices encourages greater exposure to screen media among children. According to the Department of Statistics Malaysia, a significant proportion of households in Johor Bahru own such devices: 98.4% have a TV, 97.1% own a smartphone, and 95.3% have internet access via mobile or fixed

broadband (29). Additionally, TVs and mobile devices have been identified as the most frequently used screens by children (45, 46). Thus, with easy access to these devices at home, children have more opportunities to engage in screen-based activities, such as watching television, playing video games, or using mobile apps, which may lead to prolonged screen time (45, 47). Therefore, with easy access to these devices, children may have more opportunities to engage in screen-based activities, such as watching television or using mobile apps, which may not only increase screen time but also contribute to obesity risk due to screen habits during meals (48).

Nevertheless, this study also comes with limitations. cross-sectional design limits the ability to establish causal relationships between the variables. Furthermore, the study's sample, limited to KEMAS preschools in Johor Bahru, may not fully represent the entire preschool population in the district. Hence, it is advisable to use caution when extrapolating the study's results, as the applicability to different groups may be limited. Additionally, the study's measurement tools lack differentiation between sedentary and recreational screen time, potentially affecting the assessment of health implications from different screen time behaviours. Furthermore, due to the unavailability of both parents during the data collection, this study did not examine how mothers and fathers independently influence children's screen time. Since parents usually do not play an equal role in child upbringing in Malaysia, future research should analyse these relationships separately.

CONCLUSION

Although several studies in Malaysia have examined screen time among preschoolers, they often did not investigate the associated factors contributing to excessive screen time (28, 49), nor did they specifically focus on the population with excess weight (3, 33). The socioecological model utilised in this study allows a comprehensive understanding of the multi-level factors influencing screen time among preschoolers with excess weight encompassing intrapersonal, interpersonal, organisational and community factors.

Therefore, to prevent further increases in excess weight in children, especially those that resulted from a sedentary lifestyle such as excessive screen time, targeted engagement with parents is essential, especially if the parents are working. The health promotion and education programmes should instruct parents on monitoring their own and their children's screen time, fostering self-awareness and promoting responsible screen habits within the family. This can be accomplished through parent-child associations, school health team visits, and workplace health education and promotion. In addition, strategies to transform sedentary TV and handheld device use into active

screen time should be devised in partnership with the ministry and a technology company. Since there is yet a specific guideline on screen time usage in Malaysia for children aged five years and above, developing tailored guidelines is crucial to help parents, teachers and the community manage and control their children's screen time.

In summary, parental employment status, parent's screen time, and the presence of TV and handheld devices at home were significant determinants of screen time among preschoolers with excess weight in Malaysia. To enhance their efficacy, interventions should prioritise parental involvement, particularly among employed individuals.

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