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Review Article

Association between snacking and obesity in children: a review

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ABSTRACT

Snacking is consumption of food and drinks between meals, which has contradict perception toward intake quality of the children. This study aim to inform the readers how snacking associated with weigh gain in the children. This data was collected from published papers between January 2004 to 2014 used Google scholar and PubMed databases. The articles were limited to English language only which focus on snacking, obesity and children as keywords. Snacking has great influence to the diet quality of the children particularly body mass index (BMI). Those who ate snack with large portion and size more frequently will have high risk to be obesity conversely those who eat snack without hungry feel will improve diet quality in children. Snacking is not only independent factor that contribute to the weight gain in children but it also has positive impact to the diet quality. Further investigation needed to find the clear understanding of influence or association of snacking toward weight gain.

Keywords: Snacking, Obesity, Children

INTRODUCTION

Snacking is specific eating practice that was commonly consumed by children nowadays. A snack defined as solid food(s) including those typically eaten with a utensil (with or without a beverage) that occurs between habitual meal occasions for the individual, is not a substitute for a meal, and provides substantially fewer calories than would be consumed in a typical meal.[1] Carmen P and Barry M. Popkin, 2010 said that children ages 2–18 are experiencing important increases in snacking behavior and are moving toward a consumption pattern of three meals plus three snacks per day.[2] Snacking incidence in all age groups including children has increased over the last 25 years whereas percentage of the population reporting consumption of three or more snacks per day has increased fourfold.[3] In the United States, snacking represents about 20–27% of the kcal/day of total energy, in children, snacking trends are moving toward 3 snacks/day, and more than 27% of children's daily calories are coming from snacks.[4]

Snacking viewed as being food that is eaten as addition to 3 standard meals that consumed between breakfast, lunch and dinner. It's more frequently than three substantial meals a day therefore snacking perceived as providing extra calories.[5,6] Increased meal frequency, particularly in the form of snacking, is one aspect that has received considerable attention mainly because of its assumed role in the rise in obesity prevalence observed in both children and adults.[3]. It is a popular belief that people who eat snack frequently have a bad diet and they are either overweight or will become overweight, therefore some researchers believe that snacking may play an etiologic role in obesity.[5] Nicklas et al., 2003 observed 1562 children in the Bogalusa Heart with cross sectional study stated that sugar sweetened beverages as part of snack were associated with being overweight and it has been also investigated in two prospective studies.[7]

In contrast, others studies also regarded snacking beneficial in meeting nutrient needs. Sebastian et al., 2008 observed 4357 adolescents 12-19 years and found

that snacking enhances the intake of vitamin C, fruit and oils; increases the likelihood of meeting fruit recommendations; and decreases intake of solid fats on an adjusted kilocalorie basis.[3]. Additionally, Boon TY, et al., 2012 also observed 156 students in Kuala Lumpur conclude that there was no significant association between snacking patterns and BMI.[8] These literatures explain us that snacking toward obesity still unclear and need further study to bring us in the same perception. Therefore, this study aims to inform the readers about how snacking associated to obesity in Children.

METHODS

Data for this review were collected from published papers between January 2008 to 2014 used Google scholars. The articles were limited to English language only by used Snacking, obesity and children as keywords than continued by viewed their tittle and abstract.

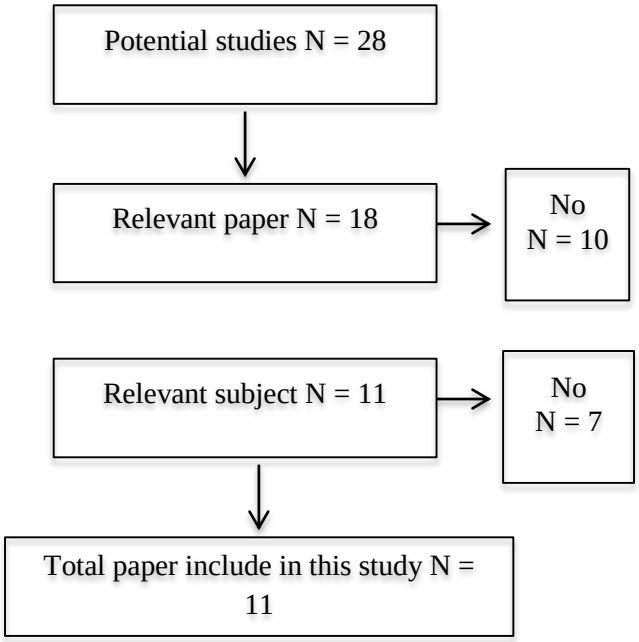

Figure 1: Flow diagram of study selection.

RESULTS

Entire relating papers in this study were identified for review. These papers focus in snacking and obesity in children were published in journals articles between 2004 till 2014 (within last 10 years), such elaborated in Table 1 below. Snacking is common practice in children that defined as the consumption of food and drinks between meals. This study has viewed eleven papers that informed us about relation snacking and obesity in children whereas found seventh studies conclude no significant correlation between snacking and weight gain, one study stated inverse association and two studies stated significant association. Based on this finding we can conclude that most of previous study mentioned that snacking in itself is not a problem, but poor food choices in terms of type and quantity are of great concern.[14]

DISCUSSION

This study shows us that snacking is increasingly in the children and it will affect to the diet quality. Study which mentioned that no significant association between snacking and weight gain argued that snacking is contribute substantially to nutrient intake for all age group. Snacks prefer to the improvement of intake quality, therefore snack will not affect weight for every single child. This conclusion relevant to the numerous previous studies that said snacking has been shown to contribute significantly to nutrient intake, and diet quality, and to an increased likelihood of meeting selected national food recommendations.[3,8-10] Consistent to the idea Guy H Johson, 2010, said that snacking per se, may not necessarily predispose to overweight and that those individuals who snack throughout the day may have positive advantages, in terms of body weight control, over those conforming to a rigid pattern of three meals a day. In addition, snacking for most individuals appears not to adversely affect body weight control, and for some may improve control. This situation may exist because frequent eating helps appetite control, thus preventing overeating at meals.[18]

While study that stated there is inverse relation between snacks and weighs gain is something that unexpected result but it was happened in the previous study, which reported that many individuals underreport their energy intake relative to their actual energy intake (or energy need for weight maintenance). The greater the magnitude of underreporting of energy intake, the less frequently individuals also report eating and it follows that the apparent inverse relation between eating frequency and adiposity.[6,12]

For those who conclude that there is significant association between snack and obesity assumed that eat frequently especially food that contain of high sugar such as soft drink and sweet sugar beverage will increase the calorie intake and led us the weight change. It is relevant to the previous study that said eating between meals in a non-hungry state is more common and based on preliminary experimental evidence should be discouraged, because it is likely to promote excess weight gain. Eating 3 times/d was associated with a mean BMI value in the normal weight range, whereas eating >3 times/d was associated with mean BMI values in the overweight range.[6] It also suggests that when energy intake at each eating occasion is not monitored, there is a risk for appetite dysregulation and hence weight gain, particularly at eating frequencies above 6 times/d and snacking, or eating between main meals both controlled feeding studies and free-living especially in a non-hungry

Table 1. Review of association between snacking and obesity in children.

No	References	Sample & population	Study Design	Finding (Association between snack and obesity)	Comment
1.	Teo Yee Boon, et al. 2012.	A total of 156 adolescents aged 13-15 years old.	Cross sectional	No significant association.	These findings indicated that snacking patterns was associated with energy and nutrient intakes but no with BMI.[8]
2.	Rhonda S. Sebastian, et al. 2008.	4357 adolescents 12–19 years of age.	Cross sectional	There was no significant association.	Snacking enhances the intake of vitamin, increases the likelihood of meeting fruit recommendations and decreases intake of solid fats.[3]
3.	Theresa A. Nicklas, et al. 2013.	Children 2-18 years of age (y) (n = 14,220)	Cross sectional	No significant association	Snacking has been shown to contribute significantly to nutrient intake, and diet quality, and to an increased likelihood of meeting selected national food recommendation.[9]
4.	Eline W. M. Scholten, et al. 2014.	N=1,377 with a mean age 10 years for the children	Cross-sectional	No significant association	Children who consumed more unhealthy snacks were lower in weight than children who consumed less unhealthy snacks.[10]
5.	AE Field, et al. 2004.	8203 girls and 6774 boys, 9–14 y old	Cross sectional	Inverse association between snack and weight change among the girls	Snack is not an important independent determinant of weight gain among children and adolescents.[11]
6.	Debra R Keast, et al. 2010.	5811 adolescents with 12-18 years old	Cross sectional	Snackers compared with nonsnackers were less likely to be overweight or obese and less likely to have abdominal obesity	Snacking was shown to be associated with improved diet quality and increased intakes of fruit, whole grains, fiber, and vigorous physical activity.[12]
7.	Gail Woodward-Lopez, et al. 2010.	Paper published between 1970-	Systematic literature review	Significant positive relationship	Sweet beverage contribute more

No	References	Sample & population	Study Design	Finding (Association between snack and obesity)	Comment
		2010		between sweetened beverage intake and adiposity	energy than any other single type of food, they also the top source of liquid energy and commonly consumed in USA.[13]
8.	M. Steiner-Asiedu, et al. 2012.	121 adolescents (54 females and 67 males) 11 and 15 years old.	Cross sectional	Snacking on foods high in sugar and fats were strongly associated with the likelihood of being overweight or obesity (high BMI)	Snacking while viewing TV among students was associated with increase in BMI.[14]
9.	Sarah M. Phillips, et al. 2004.	N=196 premenarcheal girls 8-12 years old.	Cross sectional	No significant association	Soda was the only energy dense snacks (EDS) food that was significantly related to BMI z score over the 10-year study period, but it was not related to % BF.[15]
10.	Brian Wansink, et al. 2013.	201 children (115 girls).	Cross sectional.	The effects of the snack conditions on caloric intake were more pronounced among overweight or obese children (P = .02)	The effect was more pronounced among children who were overweight or obese and children from low-involvement families.[16]
11.	Teresia M. O'Connor, et al. 2005	N = 1572 preschool age children 2 – 5 years old.	Cross sectional	No significant correlation.	Few overweight children in this study so too low to detect association energy intake and BMI and it does not capture physical activity of the children for all days.[17]

state, is detrimental to energy regulation and likely leads to weight gain. Another previous study said that snacks that has a high content of saturated fat, salt and refined sugars such as chocolate bars, crisps, cakes and pastries are termed unhealthy and are responsible for the elevation of total cholesterol, blood pressure and body weight which are major risk factors of coronary heart diseases, stroke and diabetes. Snacking on the wrong foods in addition to large portions of snacks has been shown to contribute to the increasing global overweight/obesity trends.[14] Same as to the soft drinks and sugar-sweetened beverages which have higher contribution to energy intake among overweight children and becoming obese over the follow-up period.[15]

Limitations

This study reviewed was relatively few, distributed across many years and mostly used cross sectional design, another limitation of this study is the lack of agreement on the definition of snack also portion and size of the snack that child consumed, so it's hard to compare and

determined whether snack in term of portion and size affect the children weight or not. Therefore to determine association between snacking and obesity, further prospective studies are needed.

CONCLUSION

Snacking has influence to the children diet intake but is not important independent factor that contribute to the weight gain in children. Nevertheless, snack also has positive impact to the diet quality, which could change the weight. Snacking toward obesity in children is something that counterpart and still mixed, need agreement on the definition of snack also with portion and size of the snack to find the clear interpretation the literature in this area. Then ultimately, it will improve people understanding about association of snacking to the obesity in children.

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