RESEARCH

Sensitivity to reward, food addiction and obesity in mothers and children

Sensibilidad a la recompensa, adicción a la comida y obesidad en madres e hijos

Sensibilidade à recompensa, dependência alimentar e obesidade em mães e filhos

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Abstract

Introduction: Overweight and obesity are considered an epidemic that affects the population of all ages. The characteristics present in the mother and school age children dyads such as sensitivity to the reward upon eating in excess and the addiction to food can be potential regulators of body weight. **Objective:** Understand the influence of sensitivity to rewards, addiction to food and the maternal nutritional status in regard to sensitivity to rewards, addiction to food and nutritional status of children. **Methodology:** Descriptive-correlational design. Sample composed by 218 pairs. Weight and size were measured, applying a sociodemographic data card, as well as four measurement instruments. The data was captured and analyzed throughout SPSS. **Results:** 69.3% of the mothers were overweight and obese, and 27.9% of the children. They reported high sensitivity to reward (38.4 and 40.4), and mean higher in those overweight and obese ($p < .001$). 13.8% of mothers and 8.3% of the children presented addiction to food. Mothers and children with addiction to food showed a higher score of sensitivity to reward ($p < .001$). The body mass index, sensitivity to reward and addiction to food on the mothers' behalf influenced the body mass index of the child ($p < .005$). **Conclusions:** These maternal characteristics would be present in children, they can increase according to age, persist into adult age and be transmitted towards their future children.

Key words: Obesity; Food Addiction; Reward; Maternal Behavior (DeCS).

Resumen

Introducción: El sobrepeso y la obesidad se consideran una epidemia que afecta a la población de todas las edades. Las características presentes en las diada madre e hijo escolar como la sensibilidad a la recompensa al comer en exceso y la adicción a la comida pueden ser potenciales reguladores del peso corporal. **Objetivo:** Conocer la influencia de la sensibilidad a la recompensa, la adicción a la comida y estado nutricio materno sobre la sensibilidad a la recompensa, la adicción a la comida y estado nutricio del hijo. **Metodología:** Diseño descriptivo-correlacional. Muestra conformada por 218 diada. Se midió el peso y talla, se aplicó una cédula de datos sociodemográficos, y cuatro instrumentos de medición. Los datos se capturaron y analizaron mediante el SPSS. **Resultados:** El 69.3% de las madres presentaron sobrepeso y obesidad, en los hijos el 27.9%. Reportaron alta sensibilidad a la recompensa (38.4 y 40.4), medias mayores en aquellos con sobrepeso y obesidad ($p < .001$). El 13.8% de las madres y el 8.3% de los hijos presentaron adicción a la comida. Madres e hijos con adicción a la comida presentaron mayor puntaje de sensibilidad a la recompensa ($p < .001$). El índice de masa corporal, sensibilidad a la recompensa y adicción a la comida de la madre influyeron sobre el índice de masa corporal del hijo ($p < .005$). **Conclusiones:** Estas características de la madre estarían presentes en los niños, podrían aumentar conforme aumenta la edad, persistir en la edad adulta y ser trasmitidas hacia sus futuros hijos.

Palabras clave: Obesidad; Adicción a la Comida; Recompensa; Conducta Materna (DeCS).

Abstrato

Introdução: O sobrepeso e a obesidades ao considerados uma epidemia que afeta a população de todas asesidades. As características presentesnas díades da mãe e do filho na escola, como a sensibilidade à recompensa por comer demais e dependência alimentar, podem ser potenciais reguladores do peso corporal. **Objetivo:** Conhecer a influência da sensibilidade à recompensa, o vício no alimento e o estado nutricional materno na sensibilida de à recompensa, o vício no alimento e o estado nutricional da criança. **Metodologia**: Desenho descritivo-correlacional. Amostra composta por 218 díades. O peso e a estatura foram medidos, um cartão de dados socio-demographic foi aplicado e quatro instrumentos de medição. Os dados foram capturados e analisados usando o SPSS. **Resultados:** O 69,3% das mãesa presentavam sobrepeso e obesidade, nas crianças 27,9%. Eles relatara malta sensibilidade à recompensa (38,4 e 40,4), médias mais altas naqueles com sobrepeso e obesidade (*p* <0,001). 13,8% das mães e 8,3% das filhos tinham dependência alimentar. Mães e crianças com dependência alimentar tivera mum maiore score de sensibilidade à recompensa (*p* <0,001). O índice de massa corporal, a sensibilidade à recompensa e a dependência alimentar da mãe influenciaram o índice de massa corporal da criança (*p* <0,005). **Conclusões:** Essas características da mãe estariam presentes nos filhos, poderiam aumentar com o aumento da idade, persistir na ida de adulta e serem transmitidas a os futuros filhos.

Palavras-chave: Obesidade; Dependência alimentar; Recompensa; Comportamento materno (DeCS).

Introduction

Overweight and obesity (SP/OB by its acronym in Spanish) are considered an epidemic[1, 2] and the fifth highest risk factor of death throughout the world, they are considered the first type of diabetes mellitus type 2 as well as other sources of cardiopathic ischemic diseases, some types of cancer and premature death[3]. The World Health Organization[4] reports that 52% of the world population presents SP/OB as well as 18% of the child population. In Mexico, the prevalence is greater than 72% in the adult population and 33.2% of children present this condition [5].

The increase of SP/OB in adults as well as children makes necessary to understand the causes that generate it. Studies have identified the contributing factors of SP/OB, including access to hyper-caloric food, the consumption of amounts of food in an unmeasured manner and the reduction of exercise[6, 7]. But, recently, some of the variables have become of particular interests to explain the development of SP/OB

and have been the sensitivity to the reward (SR by its acronym in Spanish), excess eating and Food Addiction (AC by its acronym in Spanish), which can be considered as possible regulators of body weight[7, 8].

SR refers to the searching for substances, appetizing and gratifying experiences within the context of nutrition[9]. Nutritional problems associated with SP/OB as well as AC referring to this as the excessive ingesting of foods with a high caloric intake accompanied by a loss of control and intense cravings for food were observed in mothers with high SR associated to SP/OB as well as AC referring to this as the excessive ingesting of foods with a high caloric intake along with the loss of control and intense cravings for food; some authors have mentioned that there could be an SP/OB phenotype[6, 8, 10, 11 - 14].

Both SR and AC could be related to SP/OB. There exists a possibility directly proportional that children with high SR and AC have mothers with the same situation[15]. Given that preferences and rejection towards certain determined foods within school-age children can be conditioned mainly by the mother, considering the main supplier and in-charge and responsible of preparing food at home in the majority of the cases[9, 15, 16]. It is important to understand the relationship of these variables given the fact that the underage minors group is at risk of developing SR associated to an addictive behavior and influenced SP/OB behavior mainly by the maternal behavior [7, 9, 14, 15, 17, 18].

The present study will contribute to the nursing and health knowledge repertoire in general and identify the general factors of nutritional behavior as well as to understand addictive behavior and rewards and in which manners the mothers and children are influenced[15, 17]; strategies can be developed in regards to effective prevention and promotion focused on the reduction of the impact of maternal conducts on the children[9]. Based on the foregoing, the purpose of the present study was to determine the influence of sensitivity to the reward, food addiction, and the nutritional state of the mother in regard to sensitivity to reward, food addiction and nutritional state of the school-age children.

Research Hypothesis

Ho= Body mass index, sensitivity to reward and food addiction on behalf of the mother do not influence in regard to the body mass index, sensitivity to reward and food addiction in school age children.

Ha= Body mass index, sensitivity to reward and food addiction of the mother influences in regard to the body mass index, sensitivity to reward and food addiction within school age children.

Methodology

Study Design

The present study was of the descriptive-correlational type.

Study Variables

Maternal SR is the maternal behavior manifested throughout the mother which seeks food which unleash appetizing and gratification experiences, feeling excited, full of energy and having excitement to experiment new sensations. The SR of the child is the behavior observed by the mother in regard to nutrition that unleashes appetizing and gratifying experiences, which makes them feel excited, full of energy and consume food full of energy looking forward to new emotions and sensations. The maternal AC is the behavior which the mother manifests in regard to the excessive ingestion of food with a high caloric content along with the loss of control, tolerance, abstinence and cravings, greater amount of time invested in the consumption of food, abandonment of important activities, consumption despite the consequences and an important clinical alteration. The AC of the school age child is the behavior stated by such child in regards to the excessive ingestion of high caloric content food along with a loss of control, tolerance, abstinence, desire, more time invested consuming food, abandonment of important activities, consumption despite the consequences and an important clinical alteration.

The body mass index (BMI) within the mother is the result of dividing the weight in kilograms by the size in square meters (kg/m^2), lower weight (<18.5), normal weight (18.5-24.9), overweight (25-29.9), obesity (>30). The BMI in school-age children is the result of dividing the weight in kilograms by the size in

square meters (kg/m^2), considering the percentage for normal weight (<85), overweight (85-94.9) and obesity (≥95) depending on the age and gender. The age of the mother is considered as the time elapsed since the date of birth, evaluated in terms of years that the mother reported upon having the interview, as well as the age of the school age child is the time elapsed since the birth of the school age child, evaluated in the terms of years that the school age child had when was interviewed and the gender of the school age child is what is attributed to women and men at the social and cultural level parting from the biological gender; it was evaluated according to the verbal report in regards to the use of terms of female and male reported by the school age child.

Population, sample, and sampling

The population of interest consisted of 703 pairs (mothers and children between the ages of 6 and 12 years), currently in school and in the public education system of Nuevo León. Sampling was probabilistic by one-stage sampling.

In order to determine the size of the sample, the nQuaryAdvisor® version V7.0 was used; it was estimated that Multiple Linear Regression Model was made with 5 independent variables which had a significance level of .05, a potency level of .90 and an R2 Coefficient Determination of .08[19]. There was a sample obtained of 196 participants, upon considering a non-response of 10% there were 218 dyads of mothers and school age children.

Inclusion Criteria

Mothers and school age children that can remain standing at least 5 minutes in order to be weighed and measured. Mothers of school age children who accepted their participation, as well as having their child take voluntary part of the study.

Exclusion Criteria

School age children with some type of physical disability. Mother who are illiterate and have some type of physical limitation.

Measurements

There was a socio-demographic data card applied to register the age (years), gender (male and female), education level (years of study), weight (kg) and size (cm) and four questionnaires. To measure maternal SR the Carver Behavioral Activation Scale was used (hereinafter called BAS, due to its acronym in English)[20] in its Spanish version[21]. The SR of school age children throughout the Scale of the System of Behavioral Activation for parents[22].

BAS and BASP are comprised by 13 items respectively; they are divided into 3 sub-scales, the first one being Sensitivity to Reward with 5 items [2, 4, 8, 10 and 13], the second one was denominated Motivation with 4 items [1, 5, 7 y 12] and the third one Search of emotions with 4 items [3, 6, 9 and 11], which are graded by a Likert type scale of 4 points that ranges from 1=Totally in disagreement to 4=Totally in agreement, the highest grade indicate a greater SR. The BAS scale obtained a Cronbach α of .93 in the present study, while the BASP scale a Cronbach α of .94.

The Yale Food Addiction Scale (YFAS)[23] measured the AC of the mother; the AC of the child was measured with the Yale Food Addiction Scale in the version for children (YFAS-C)[15], which are based on the dependence of substances for the Diagnostic Medical Sonography (DMS-V) upon adjusting nutritional behavior. These measurements of self-information consist of items, include Likert type answers (never up to 4 or more times per week) as well as dichotomy (yes or no). The scales have 7 dimensions of symptoms, which are distributed in the following manner: 1) too much time invested in consumption, 2) tolerance, 3) abstinence, 4) persistent craving, 5) food consumed in greater amounts and during a longer period of time, 6) abandonment of important activities, 7) consumption despite the consequences and clinical significance.

The AC diagnostic was obtained throughout the sum of at least 3 symptoms and 1 clinical significance. In the present study, the YFAS scale presented a Cronbach α of .94. While the YFAS-C presented a Cronbach α of .92.

In order to evaluate the nutritional state, weighing and measuring was performed by using a SECA 750   was previously calibrated and the weighing was performed by using a portable standard SECA 213 scale, the measurement of the size of the mother as well as for the child. The BMI was obtained throughout the formula BMI=kg/m^2, with this, each mother was classified according to the OMS (24) criteria, that (<18.5), normal weight (18.5-24.9), overweight (25-29.9) and obesity (>30); for the children, the CDC[25]classification was used considering the percentile for normal weight (<85), overweight (85-94.9) and obesity (≥95) depending on the age and gender.

Procedures

First of all, the authorities on behalf of the Research and Ethics Committee in Research of the Nursing Department from Universidad Autónoma de Nuevo León and the authorities of the educational institution. The registry number of the committee was F-1503.

There was an invitation delivered to the children to invite their mothers and were provided informed consent for mothers and a no-objection letter for the children days prior to the administration of the measurement instruments.

Once that the mothers sent back the invitation through their children, the informed consents were reviewed as well as the consent of the mothers who accepted to take part on the study. On the days and hours scheduled they were asked to be placed in a conditioned classroom, and once again had the objective explained to them as well as the instructions in order to answer each instrument protecting the privacy of the mother as well as the child by remaining anonymous. Later, the weighing and measurements included in the considerations determined under NOM-031-SSA2-1999, NOM-043-SSA2-2012 and NOM-047-SSA2-2015.

Statistical Analysis

The data was captured and analyzed through the use of the Statistical Package for the Social Sciences (SPSS) version 22 for Windows. Descriptive statistics was utilized for socio-demographic and inferential variables

for study variables. *U* from Mann-Whitney was used, Chi-square from Pearson as well and the Correlation Coefficient of Spearman. For the estimation of effects in regard to continuous dependent variables, such as BMI and SR, Multiple Lineal Regression Models and Logistic Regression in the case of the AC.

Ethical considerations

The study followed the provisions stated in the General Health Research Law for the Research of Health Matters[26]. The present study followed the ethical aspects for the development of research nvestigation in human beings.

Results

218 countries participated. 57.3% of the mothers were married and 71.6% were home-makers, the average age group was 33.95 years (*SD* = ±4.86), the average educational years of education was 11.9 (*SD* = ±2.45). In regard to anthropometric characteristics 38.1% presented SP and 31.7% OB, the BMI average was 27.8 (*SD* = ±4.83).

According to the socio-demographic and anthropometric data on school-age children, it was obtained that 50.9% of the participants were of the female gender, the average age was 9.8 years (*SD* = ±1.49). In regard to the anthropometrics characteristics, 72% were found in the normal weight of BMI, 12.80 % in SP and 15.1% in OB. The average BMI was 18.1 (*SD* = ±3.95).

According to maternal SR as well as that of the school age child, there was an average presented SR of 38.4 (*SD* = ±10.78) within the mothers. In regard to the comparison between the mothers with normal BMI, the average SR was of 29.44 (*SD* = ±12.12), with it being greater in mothers with SP ($\bar{X}$= 41.2, *SD* = ±7.89) and OB ($\bar{X}$= 43.7, *SD* = ±6.83). The mothers with a higher BMI presented scoring average of SR that was higher (*H* = 49.64, *p* < .001). There were no significant differences presented in regard to age (*p*>.05).

There was an average SR of 40.4 (*SD* = ±10.50) presented, in regards to the comparison between children with a normal BMI, the average SR was of 38.7 (*SD* = ±11.21), being greater in kids with SP ($\bar{X}$= 42.4, *SD* = ±7.98) and OB ($\bar{X}$= 47.1, *SD* = ±5.59); the children with elevated BMI presented a higher SR in

comparison with the children that had normal BMI (H = 20.73, p< .001). There were no significant differences reported in regard to age and gender (p> .05).

In regard to AC, 13.8% of the mothers and 8.3% of the children presented AC. According to the BMI category, AC was reported more often in mothers with SP (10.8%) and OB (29%), in mothers with normal BMI, AC was present less often (1.50%). A higher percentage was of AC was reported in children between the ages of 11 and 13 years (16.5%), in comparison with younger children who reported percentages between 2.5 and 3.8% (X^2 = 12.477, p = .002). According to the BMI category, AC was reported as presenting higher frequency in children with SP (14.3%) and OB (24.2%), in children with normal BMI it was less present (3.8%) (X^2 = 16.553, p < .001); these differences were significant.

In table 1, the mothers AC presented an average SR greater in comparison with the mothers without AC (U = 1363, p = .001). Also, the children with mothers that presented AC, had a greater SR average (U = 1375.50, p = .001). According to the mothers with children that presented AC, these presented an average SR higher in comparison that those mothers that had children with AC (U = 664, p = .001). In regard to the children with AC, they had a higher SR than those with AC (U = 681.50, p = .001).

The maternal SR variables and BMI of the mother is correlated in a positive and significant manner (rs = .442, p = .001), a greater maternal SR was BMI. In case of the SR variables on behalf of the child and the BMI of the child was also found to have a positive correlation and significance (rs = .326, p<.001), the greater the SR of the child the greater the BMI was. There was a positive and significant correlation found between maternal SR and the Child's SR (rs = .837, p<.001), which means, a greater SR in the mother the greater the SR was in the child. Between the BMI of the mother and the BMI of the child (rs = .461, p<.001), the greater the BMI of the mother, the greater the BMI in the child.

Table 1. Difference in AC according to SR in mother and children

AC of the mother		n	SR $\overline{X}$	Mdn	SD	MinValue	MaxValue	U
Mother	With AC							1363**
	Without AC							
Child	With AC							1375.50**
	Without AC							
AC of the child		n	SR $\overline{X}$	Mdn	SD	MinValue	MaxValue	
Mother	With AC							664.0**
	Without AC							
Child	With AC							681.5**
	Without AC							

Note: $\overline{X}$ = Mean, Mdn = median, *SD* =standard deviation, Min Value = minimum value, Max Value = maximum value, *U* = U of Mann-Whitney, ** = *p<*.001, *n* = 218

There was a Multiple Linear Regression made using the "Backward" method with the SR of the child as an independent variable; maternal SR was found to present significant statistics (*p* = .001), 75.8% explained the variance, F (1, 217) = 680.52, p = .001, IC 95% [4.96, 10.13] (Figure 1).

Figure 1. Maternal SR Effect SR regarding the SR of the child.
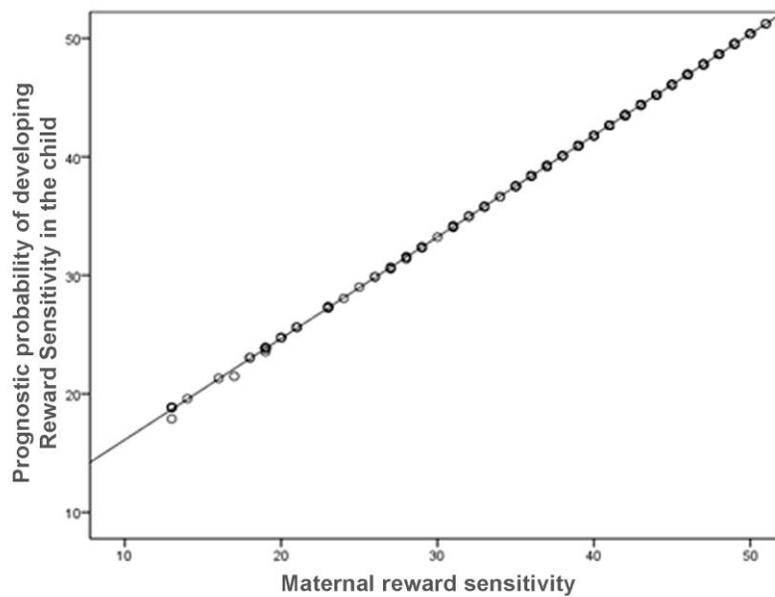
Source: Own development

Later, there was a Logistical Regression Model performed using the "Backward" model with the AC of the child as a variable dependent. The variables that contribute to the model are maternal SR (OR = 1.122, p = .019) and the AC of the mother (OR = 9.381, p = .001) observing statistical significance (R^2= 37.6%, p = .001) (Figure 2).

Figure 2. For the purpose of SR and maternal AC regarding the child
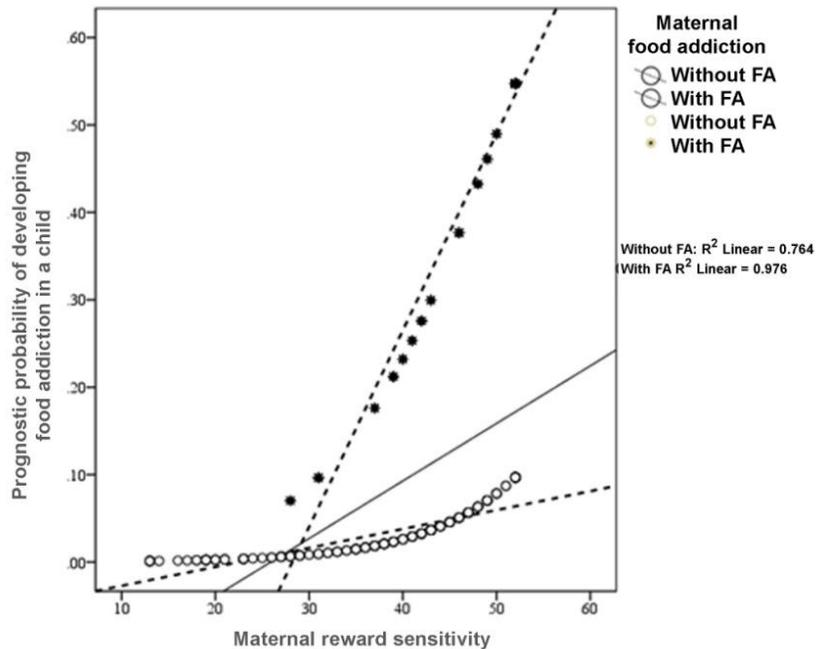
In regard to the variables that influenced BMI of the child. The results of the Multiple Linear Regression Model Coefficient only show a model with statistical significance, F (5, 212) = 25.92, p = .001, IC 95% [5.75, 11.44]. The maternal SR, AC of the mother and BMI of the mother influence in a significant manner the BMI of the child (p = .001) (Figure 3 and 4).
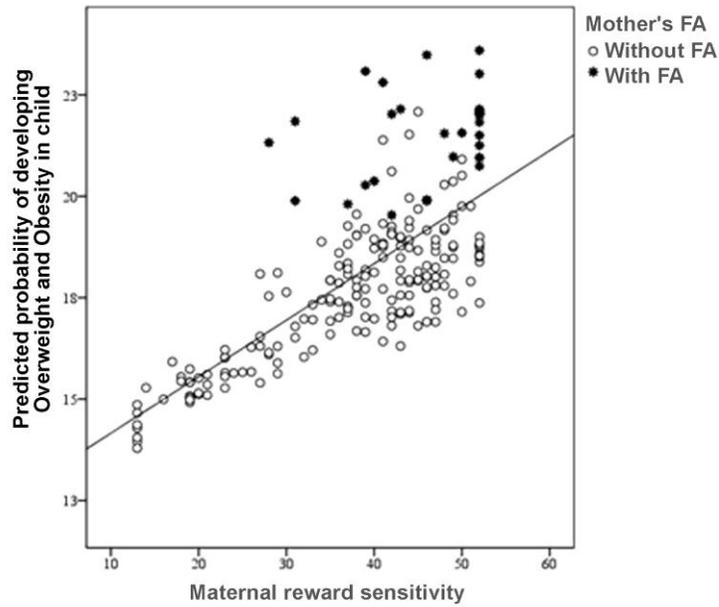
Figure 3. Effect of mother's SR and BMI on child's BMI.
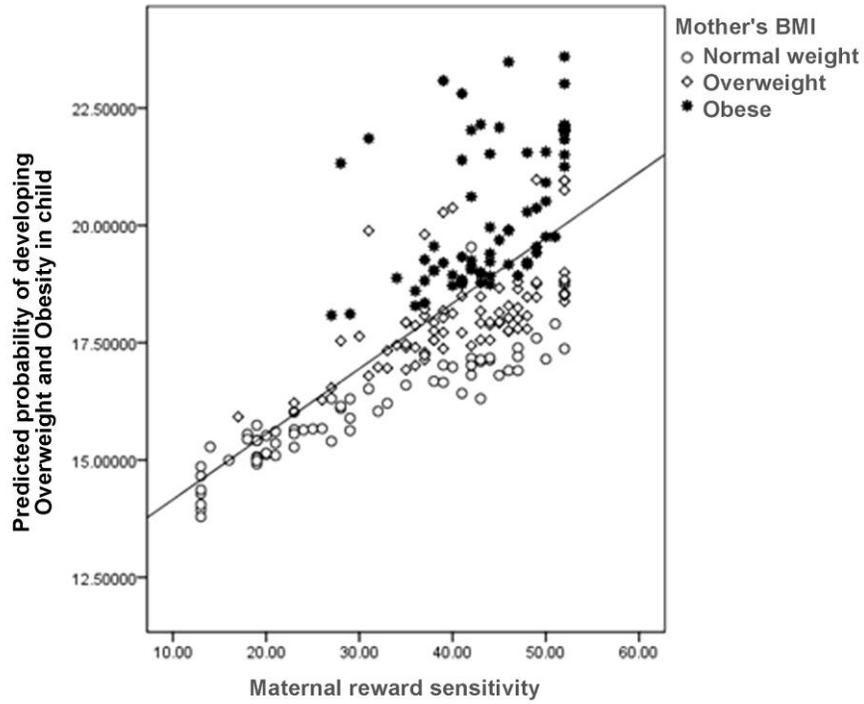
Source: Own development

Figure 4. Effect of maternal SR and FA on child's BMI.

Source: Own development

Discussion

The present study includes literature limited to SR and AC in pairs of mothers and school age children, based on the mother and child self-report. The results, greatly replicate the findings of other studies in adults and children and show that BAS, BASP, YFAS and YFAS-C are appropriate measures to evaluate SR and AC in both populations; therefore, it can be determined that SR and AC are not restricted to just the adult population, but are also present at an early age within school age children[8, 9, 15, 27].

In regards to anthropometric characteristics in mothers, most were overweight and obese (SP/OB); an average or media of Body Mass Index (BMI) of 27.28kg/m^2, similar to what was found by various authors[28] where there was an average reported of 27.40kg/m^2, this amount is still greater than what was found by the majority of the researches where the BMI of adults oscillates between 21.70 and 26.90kg/m^2 [8, 13, 14, 15]. In the Mexican contexts, the prevalence of SP/OB is elevated and one of the highest worldwide, being greater than the prevalence of the countries where the previous studies were performed. In Mexico SP/OB is found present within 72% of the adult population, the results of the present study are similar to the results at the national level[5].

Regarding children, 28% were identified with SP/OB, similar to what was reported by other authors[18, 29] and matching the report issued by the National Survey of Health and Nutrition[5] where it was stated that 33.2% of the child population shows this health condition at the national level.

The SR measurement in mothers (38.44) was greater than what was reported by other studies[8, 13, 14]. Given the fact that the mothers with SP/OB present higher measures of possible SR in regards to the differences and percentages of SR that could be due to the high prevalence of SP/OB reported in the current study, maybe the mothers with SP/OB have lower densities of D2 dopaminergic receptors, which implicates a high SR; moreover, it is probable that they present neuroadaptations to hyperactivity of the reward circuits at the cerebral level, serving as a risk factor to eat in excess and have SP/OB[30].

The average SR in children (40.47) was higher than that what was recorded by other authors where the average obtained was between 32.10 to 34.57[9, 17, 18]. The SR did not present any significant differences with respect to gender and age in children. This finding goes in accordance to previous studies[9, 17, 18]. In regard to the SR and BMI, the children with a high SR presented greater SP/OB. The majority of the literature has reported positive associations with SR and BMI in children with SP/OB[9, 14, 31, 32]. Likewise, there was a positive and significant relationship found between the SR of the child and their BMI, similar to the results of the OB previous studies [9, 14, 31, 32].

The finding of this study matches the premise that children with SP/OB have more probabilities of looking for and enjoying rewards when it comes to food. As a consequence, these children will probably eat in excess when the food tastes good to them and is high in calories and sugar and are readily available[9]. There was a positive and significant relationship found between maternal SR and the SR of the child, unlike the mothers who take their own decisions in regards to the selection of foods and scheduled hours to eat, with children, these hours are often established by their mother[15].

Some studies have found that frequent exposure on behalf of the mother towards the child in regards to hypercaloric food that is high in grease and sugars produces an alteration in SR, which leads to an increase in the ingest of hypercaloric food[33]. There exists a possibility that maternal SR leads to an alteration from a genetic level, therefore, affecting the control of appetite and the preferences for the consumption of inappropriate food in children[33, 34], perhaps high SR and SP/OB in children is being programmed from the moment of conception[35] and reward pathways are developed in the uterus altering the neuro-adaptive responses of the SR in the child[33].

In regards to the AC, 13.8% of the mothers showed this condition. A greater prevalence of AC in mothers older than 40 years old was present, these proportions showed no significant differences, similar to the majority of the previous studies[10, 13, 15, 28]. In regards to the AC and BMI in mothers, most of the

studies point out the fact that there will exist more prevalence of AC in individuals with SP/OB [10, 13, 15, 28], according to the findings of this study, there was a greater prevalence of AC in mothers that showed SP/OB.

The literature pointed out between 56 and 88.6% of adults with SP/OB presented AC, which showed a strong evidence that the AC can contribute to the growing prevalence of SP/OB in the worldwide population, the current findings suggest that SP/OB that is present with AC can represent an important sub-group in individuals with this condition of having a distinctive etiology[28].

The percentage of mothers with AC of this study was higher than (13.8%) and higher than that reported by other studies where prevalence where found ranging from 5.7 to 12% [15, 28, 36, 37] and less than other studies where prevalence were found ranging from 17.6 to 25% in adult women[10, 13, 38]. These differences can be due to several reasons, in regard to the previous studies where AC prevalence was lower could be due the low prevalence of SP/OB; additionally, the differences in regards to the previous studies with prevalence of higher AC could be due to the inclusion criteria and the techniques in regards to the application of YFAS [15, 27].

The percentage of children with AC in this study (8.3%) was less than the prevalence reported by previous evidence (range of 8.9% to 41%) [29, 39, 40]. The differences found in this study that account for a minor prevalence than the AC in regard to other studies could be explained by the parental versions versus the self-report of the YFAS-C kids, the mothers that reported AC within their children in previous studies could underestimate the nutritional behavior of their children and be considered problematic, having a higher probability of backing up the AC diagnosis in their children.

According to the AC and BMI in children, there was a significant difference present, a greater percentage of AC in children with less than 11 years of age had similar findings that the ones reported by other authors[29], most of the studies did not have major differences[15, 39, 40]. It is probable that the AC was presented later on[29].

The majority of the studies show that a greater prevalence of AC exist in kids with SP/OB [15, 29, 40] and similar findings in the present study where there was a greater prevalence reported of AC in children that reported SP/OB.

The mothers and children with AC presented more measuring points in SR, the association between SR and AC agrees with other studies that show an association of AC and a genetic profile related to the answer to the reward in the consumption of satisfying food[6, 13]; other authors that try to explain addictive food patterns show that the exposure to highly flavored processed foods can lead to neurological adaptations related to SR[15].

In the addiction related to drugs has been demonstrated that the ventral stratium and the midbrain were associated to immediate rewards and the hippocampus responded to the consequences of the reward. It is probable that the hippocampus reflect their stored implication and recovering the memories of the food desired and rewards and reinforces anxious behavior such as eating in excess[41, 42, 43]. There could exist a processing of rewards connected to AC in regards to the searching of hyper-caloric food, high in fat and sugar as a positive reward[43].

Maternal SR, was out of the three variables, the only one that had an influence in regards to SR of the child, the SR of the child possibly has multiple factors implicated, and one of the main ones is the mother.

It was proven that mothers could direct SR of their children in the consumption of food[44]. In other models, the probability of presenting AC in children is induced in part by the characteristics present in the mother such as SR and AC [15]. In regard to the child's BMI, it was found that the mother's SR, AC and BMI played a role. In this context, possibly the family patterns, the genetic contributions, prenatal exposure to hyper caloric nutrition, the parental model of use and access within the child's environment of hyper caloric and tasty food on behalf of the mother can explain it more specifically[15].

Conclusions

In summary, BMI, SR and AC of the mother influence in regards to BMI, SR and AC of the child, in a more concrete manner, SR of the mother influenced in the SR of the child, also, SR and AC of the mother in regards to AC of the child and SR, the AC and the BMI of the mother influences in regards to the BMI of the child. These characteristics present in the mother in the SP/OB, a high SR and AC would be present in children and could continue to increase according to age and continue within older age and be transmitted towards the future of their children.

Conflicts of interest

The authors stated they did not have any conflict of interest.

Financing

None.

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