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Effect of Monosodium Glutamate Consumption on Health of Female Mice Population

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Abstract

Female metabolism is highly responding towards diet-associated changes. Due to independent living or working status young females and their young once consume wide range processed foods, which are incorporated with flavour enhancers to compensate their less nutritional value. Monosodium glutamate is a popular flavour enhancer, which is widely used to develop umami taste. Young female generation nowadays deals with more issues related to metabolism and fertility with each passing year worldwide. Present study is an effort to monitor the effect of oral consumption of monosodium glutamate on female mice health. Mice have been used as experimental model in the present study due to its higher rate of resemblance with human being. Ten adult female Swiss albino mice Mus musculus have been divided into two groups named control and treatment. Treated group received 4 gm /kg body weight/day dose of monosodium glutamate dissolved in double distilled water. While, mice belongs to control group had received only double distilled water as vehicle upto 45 days. After the completion of experiment, lee index has been calculated to determine the induced level of obesity. Present study state that lee index of monosodium glutamate treated mice were significantly higher than control mice. This increment of lee index indicates that monosodium glutamate is contributing factor for induction of obesity in female mice. Obesity is one of the prominent cause of metabolic syndrome progression. Metabolic syndromes are well known factor to adversaly affect the over all feminine health. Authors strongly discourage prolonged consumption of high doses of monosodium glutamate to avoid obese young female population.

Keywords: *Obesity, Lee index, Monosodium Glutamate, Mus musculus*

1. Introduction:

Health of young female individuals of any society is a clear reflection of their dietary habits, dietary consumables and life style. Over past few decades' prevalence of many clinical conditions like metabolic syndromes, anemia, infections and jaundice become very common among young female population, which makes it necessary to monitor the factors affecting the female health [1-4].

Dietary modulations are one of the prominent cause to facilitate the change in metabolism nowadays. The purpose of food is not limited to mainatin the vitality but to maintain the balanced health. During the evolution and social advancement the change in socioeconomic status of women indirectly imposed many additional burdens to the soulders of female individuals of family. This makes dificult for them to adopt traditional culinary methods to prepare of food for themselves and family. A sharp increment in ready to eat processed and junk foods consumption contribute in progression of various health implications in young females. Due to independent living or working status young females consume wide range processed foods, which are incorporated with flavour enhancers to compensate their less nutritional value. Young female generation nowadays deals with more issues related to metabolism and fertility with each passing year worldwide. An alarming increment in the rate of metabolic syndromes, glycemic load, body mass index and hormonal imbalance gave rise new concerns in health industry [5-6].

Monosodium glutamate (MSG) is a popular flavour enhancer, which is widely used to develop umami taste in variety of food stuffs including flavoured chips and snacks, marinated meats, fresh sausages, bottled soy or oriental sauces, and stuffed or seasoned chicken, manufactured meats, some hams, luncheon chicken and turkey, flavoured tuna, vegetarian burgers, tomato sauce, junk foods, sausages, noodles, soups, sauces, chips, packed, ready to eat, processed and branded foods [7,8]. The sodium salt of natural essential L-glutamic acid (MSG) is considered as a food ingredient that is "generally recognized as safe" by US-FDA, Federation of American Societies for Experimental Biology (FASEB) and the World Health Organization [9,10]. MSG has become one of the world's most widely used food additive used primarily for taste enhancement [11,12]. Monosodium glutamate is abundant in processed foods and restraunts preparations, this sometimes leads to unrestricted, unmonitored consumption, which affects the health by silent damage [13,14].

Body weight, body mass index and nutritional status are closely related to metabolic and reproductive functions in females [15]. Lee index is a formula based index, used to identify the obesity in rodents. Lee index could be used as the scale of wellbeing similarly as body mass index (BMI) is used in human beings to identify the health status and obesity. Present study was conducted on female mice *Mus musculus* considering its higher rate of resemblance with human being. Present study is an effort to monitor the effect of oral consumption of monosodium glutamate on the lee index as an identifier of female health in terms of obesity progression.

2. Materials and methods:

2.1 Animal handling and ethical approval:

Adult female albino mice were procured from Jawaharlal Nehru Cancer Hospital and Research Center, Bhopal, India. Mice were kept in polypropylene cages on paddy husk bedding under controlled conditions of temperature and light along with standard mice feed and water *ad libitum* through out. Animal care and handlings were performed according to guidelines issued by CPCSEA, (Committee for the purpose of control and supervision of experiments on animals) New Delhi, India. Present study is a part of the research plan approved by institutional ethical committee with reference number1885/GO/S/16/CPCSEA/IAEC/BU/05.

2.2 Experimental design:

Ten adult female Swiss albino mice have been divided into two groups named control and treatment. Treated group received 4gm/kg/bw/day monosodium glutamate dissolved in double distilled water orally for 45 days. While, mice belongs to control group had received only double distilled water as vehicle up to 45 days.

At the completion of experiment naso-anal length and weight of mice were measured using appropriate tool. Lee index were calculated for each individual belongs to control and treatment groups by reference method of Bernardis and Petterson in 1968 [16].

2.3 Statistical analysis:

The collected data were subjected to statistical analysis for determination of significance difference between control and treated group. Means, standard deviation and standard error of mean were calculated using Excel–mac operating system software. Student's 't' test was performed to determine level of significance. $p \leq 0.05$ is considered as significant.

3. Results:

At the completion of forty-five days the significant visual difference was observed between control and treated groups. Comparison of lee index revealed that MSG treated mice showed variation in the pattern of body mass increment than normal control mice. Statistically significant increment ($p \leq 0.05$) in lee index of MSG treated mice was observed during present study (Figure-1). It was observed that control female mice showed normal behaviour and moderate level of activity; while MSG treated female mice exhibit sluggish level of activity followed by stressed behaviour. Significant increase in body weight could be the reason behind obesity and associated stress induction. Hence, Present study states that lee index of monosodium glutamate treated mice were significantly higher than control mice.

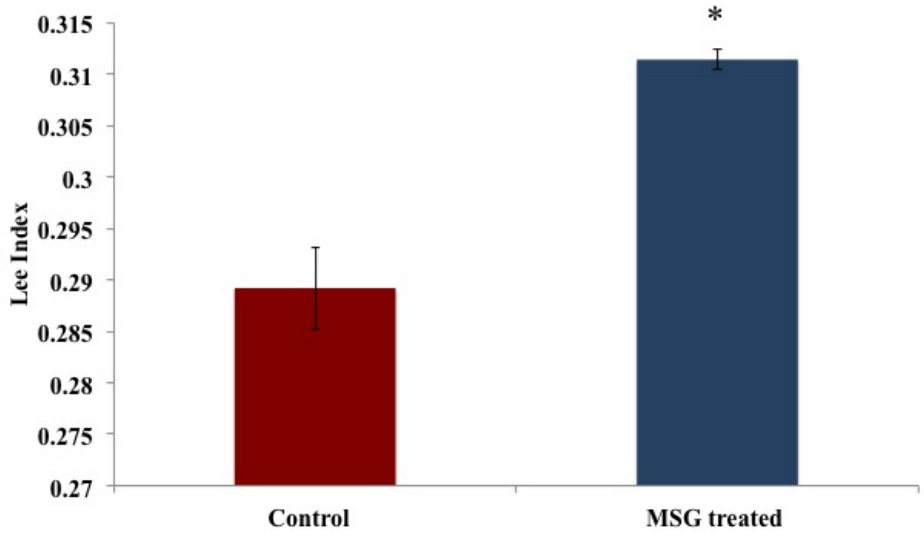

Figure 1 Significant increment in lee index after monosodium glutamate treatment.
* represents significant increment($p<0.05$) in compare to control group.

4. Discussion:

The determination of body mass index is a prompt tool to identify the health of individual to access the potential health risk without involvement of any biochemical testing. Lee index is a similar indicator to identify the progression of obesity in rodents. Significant increment in lee index or body mass index indirectly reveals that an individual is at high risk in health management. This increment of lee index indicates that monosodium glutamate is contributing factor for induction of obesity in female mice. Obesity is the root cause of metabolic syndrome, which comes with many associated feminine health issues.

MSG intake promotes the food consumption by female mice, which contributes in significant weight gain in compare to untreated control mice. Consumption of increased amount of MSG is known to generate various adverse affects [17]. Disruption of food consumption and energy expenditure is one of the prominent cause of body weight increment and progression of obesity after oral consumption of MSG [18]. Consumption of monosodium glutamate affects the appetite regulation that leads the over consumption of food, which further contribute to develop additional load on various systems of body [19]. Glutamate consumption increment of oxidative stress and reactive oxygen speies formation affects the health adversely. Reactive oxygen formation alters the overall wellbeing adversely by affecting various biological phenomena [20]. The evidence for the adverse effects of obesity on women's health is overwhelming and indisputable. Obesity substantially increases the risk of several major health concerns in women. Obesity, especially abdominal obesity, increases the risk of metabolic

syndrome, polycystic ovarian syndrome, infertility, osteoporosis, diabetes, cardiovascular disease [21-23]. The risk of death rises with increasing weight is the root cause of elevated mortality in obese females sometimes. Increased lee index is an alarming clinical feature, which silently contributes in progression of other clinical conditions over the time period [24]. Authors strongly discourage prolonged consumption of high doses of monosodium glutamate to avoid obese young female population.

5. Conclusion:

In conclusion, high consumption of MSG is a key factor for weight increment, which further contributes in obesity progression. Authors strongly recommend the strict monitoring of quantity of MSG consumed per day from all sources. Further studies are advisable to investigate the biochemical and neurological progression of MSG induced obesity.

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