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## Effects of Long-Term Consumption of Kunu Drinks on the Body and Brain Weights of Adult Wistar Rats.

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### ABSTRACT

Effects of long-term consumption of kunu drinks commonly used as non-alcoholic drinks on the body and brain weights of adult wistar rats was carefully studied. Sixteen adult wistar rats of both sexes with average weight of 180g were randomly assigned into two groups: A and B of (n=8) in each group. Animals in group A served as treated group (n<sub>t</sub>=8) which received kunu drinks and distilled water alternatively on a daily basis for 10hrs and 14hrs liberally in thirty days, while the control group received distilled water liberally for the thirty days. The rats were obtained and maintained in the Animal Holdings of the Department of Basic Medical Sciences, College of Natural and Applied Sciences, Achievers University, Owo, Ondo State, Nigeria. The animals were fed with normal rats feeds obtained from Opeyemi Feeds, Okedogbon Owo, Ondo State, Nigeria and given feeds liberally for the thirty days. The weight of the rats were measured during the period of the research and the animals were sacrificed by cervical dislocation on the thirty-first day of the experiment. The brain was carefully dissected out, weighed using Mettler Toledo weighing balance. The values obtained from the control and treated groups were recorded and compared statistically using the unpaired sample t-test and symmetric measured test of the Statistical Package for Social Sciences (SPSS version 21). The results obtained in this experiment revealed that there was a significant ( $P < 0.05$ ) increase in body weight (g) and a significant ( $P < 0.05$ ) decrease in the relative brain weight (%) of the treated animals as compared to the control animals. There was a decrease in the brain weight (g) of the animals treated with kunu drinks but not significant ( $P < 0.05$ ) as compared to the control animals. Long-term consumption of kunu drinks could therefore have adverse effects on the body and brain weights of adult wistar rats. Further studies are important to elucidate which of the kunu drinks constituents has more impact on the weight differences.

**Key words:** Body, Brain, weight, Kunu, Wistar rats

### INTRODUCTION

Kunu is a popular cereal based, non-alcoholic beverage made from millet or sorghum grains<sup>1</sup>. It is generally accepted and widely consumed in many parts of Nigeria. The beverage is stored in plastic containers and could be preserved in refrigerators. It is a considerably cheap beverage drink because; the ingredients used for the preparation are cheap and available anywhere in the market and store<sup>2,3</sup>. The local process of preparation involves wet milling of the grains. Water, spices like ginger, nutmeg and piper guinense are added to give good flavours and aromatic taste<sup>4</sup>. Wide variation exists in the methods of preparation depending on taste, culture, norms and habits. For example, some people in some regions prefers it with much pepper and sugar while some with little or no pepper and sugar<sup>5</sup>. Though consumed throughout the year, it is extensively consumed during the dry season<sup>3,5</sup>. Depending on the cereal availability, grains such as millet (*Pennisetum typhoideum*), sorghum (*Sorghum vulgare*), Maize (*Zea mays*), rice (*Orza sativa*) and Acha (*Dijitap exilis*) are commonly used for the traditional production of kunu

<sup>6,7</sup>. The variety of the drink made from sorghum is milky light brown colour, while that made from millet and maize is whitish in colour<sup>8</sup>. Species such as ginger, black pepper, garlic, red pepper and clover are commonly added as flavour to improve the taste. Sugar may be added as sweetener when necessary. In some cases honey together with small quantity of sweet potatoes, malted rice, malted sorghum and cadaba farinose crude extract may be used as the sweetener. The grain is used singly or combined; sorghum/millet is the most common combination in the ratio 1:2 (w/w)<sup>6,9</sup>.

Ayo and Okeke (2008), reported that kunu is rich in carbohydrates, vitamins, and minerals but low in protein. This drink however is still produced at village technology level, could be taken for various health benefits with none available on the effects on the nervous system<sup>8,10</sup>. Based on some of the consequences associated with kunu drinks, it would therefore be worthwhile to examine the effects of long-term consumption of kunu drinks on the body and brain weights of adult Wistar rats.

## MATERIALS AND METHODS

**Experimental Animals:** The ethical committee of the Achievers University, Owo granted the approval before the commencement of this research. Sixteen adult wistar rats of both sexes (Animals were caged based on same sex to avoid mating and pregnancy) with average weight of 180g were randomly assigned into two groups: A and B of (n=8) in each group. Animals in group A served as treated group (n<sub>1</sub>=8) while animals in group B (n<sub>2</sub>=8) served as the control. The rats were obtained and maintained in the Animal Holdings of the Department of Basic Medical Sciences, College of Natural and Applied Sciences, Achievers University, Owo, Ondo State, Nigeria.

The animals were fed with normal rats feeds obtained from Opeyemi Feeds, Okedogbon, Owo, Ondo State, Nigeria and given feeds liberally for thirty days. The kunu drinks were obtained from Mrs Christiana Abimbola Akinwale (a.k.a.Mama Kunu) in Owo, Ondo State, Nigeria.

**Kunu Drinks Consumption:** The rats in the treated group received kunu drinks and distilled water alternatively on a daily basis for 10hrs and 14hrs

liberally in thirty days, while the control group received distilled water liberally for the thirty days in line with an improved method of Adjene *et al.*, 2014<sup>11</sup>. The ingredients contained in the kunu drinks were as follows: Millet (Jero), ginger, Cloves (Kanafuru), climbing black pepper (Iyere), Capsicum species (Ata), water and sugar. The rats were sacrificed by cervical dislocation on the thirty-first day of the experiment and the brain of each animal was extracted, weighed and recorded using Mettler Toledo weighing balance. The values obtained from the control and treatment groups were recorded and compared statistically using the unpaired sample *t* test and symmetric measured test of the Statistical Package for Social Sciences (SPSS version 21).

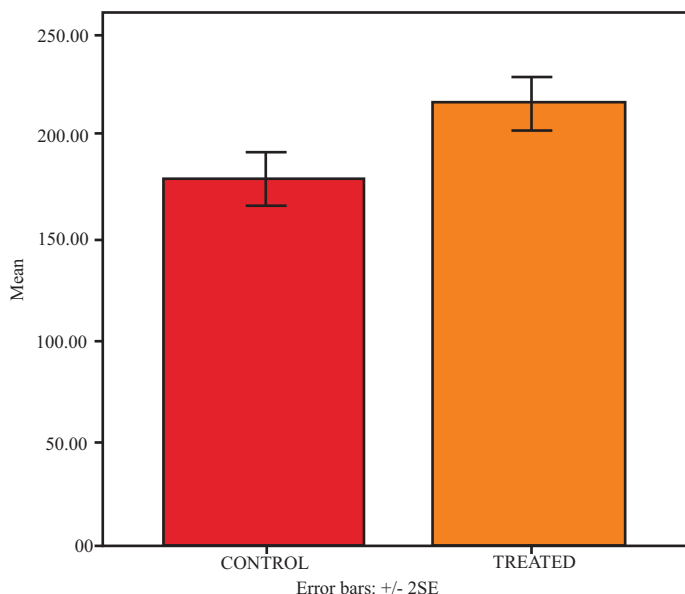
## RESULTS

The findings of the experiment revealed that there was a significant ( $P < 0.05$ ) increase in the body weight (g) and a significant ( $P < 0.05$ ) decrease in the relative brain weight (%) of the treated animals as compared to the control animals. There was a decrease in the brain weight (g) of the animals treated with kunu drinks but not significant ( $P < 0.05$ ) as compared to the control animals [Table 1 and Figures 1–3].

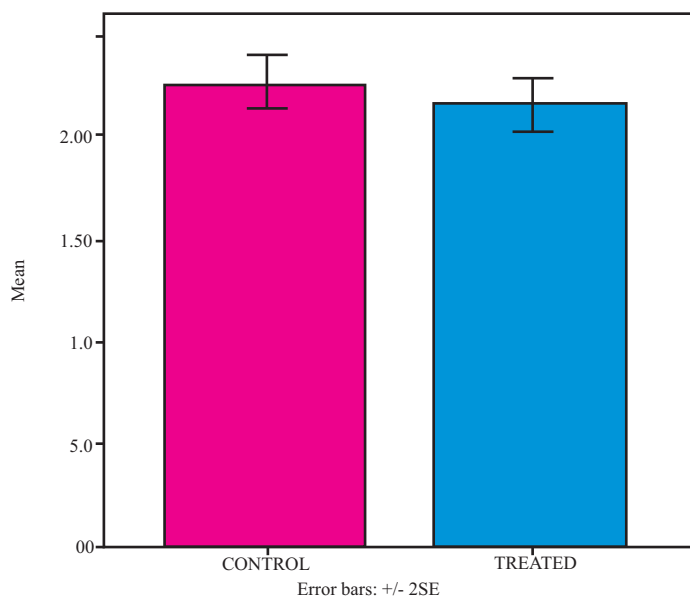
**Table 1:** The Mean weight (g) of the body, brain and Relative brain Weight (%) of the animals.

PARAMETERS	GROUP OF ANIMALS	
	CONTROL	TREATED
Body weight (g)	*179.38 ± 5.78	*217.86 ± 6.53
Brain weight (g)	1.62 ± 0.03	1.58 ± 0.03
Relative brain weight (%)	*0.91 ± 0.03	*0.73 ± 0.02

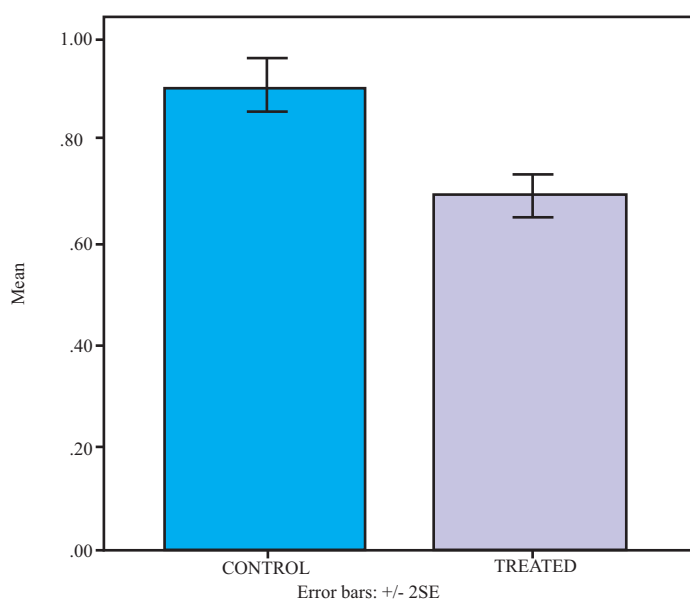
\*Significant ( $P < 0.05$ )



**Figure 1:** Bar chart showing the mean body weight (g) of the animals



**Figure 2:** Bar chart showing the mean brain weight (g) of the animals



**Figure 3:** Bar chart showing the relative brain weight (%) of the animals

## DISCUSSION

The result of this experiment revealed that there was a significant ( $P < 0.05$ ) increase in the body weight (g) and a significant ( $P < 0.05$ ) decrease in the relative brain weight (%) of the treated animals as compared to the control animals. There was a decrease in the brain weight (g) of the animals treated with kunu drinks but not significant ( $P < 0.05$ ) as compared to the control animals. It could be inferred from the study that prolonged consumption of kunu drinks may have accounted for the observations. In consonance with this experiment, chronic administration of chloroquine has been documented to be significantly ( $P < 0.05$ ) increased the weight of the inferior colliculus and

medial geniculate body in adult wistar rats<sup>12</sup>. Although, there are no existing documents to the best of our knowledge on the effects of kunu drinks on body weight, the results obtained has indicated that *Kunu* drinks could have contributed to the total energy intake of the animals<sup>13</sup>. This is in line with Ayo and Okeke (2008) who claimed that kunu is rich in carbohydrates, vitamins, minerals and some amount of protein, which could provide the body with basic energy requirement<sup>9</sup>. There could be three possible mechanisms for the increase in body weight. First, it may be due to the increased glucose and Protein supply to the body because of the higher glucose and protein content of the *Kunu* beverages. Ibegbulem and Chikezie (2005),

attempted the biochemical analysis of the kunu drinks and Terna et al., (2002) also worked on the nutrients and sensory qualities of kunu drinks from different saccharification agents<sup>14, 15</sup>. They stated the importance of this drinks to the body. It may be probable that these may have accounted for the increase in weight during the period of treatment in this experiment. In their various studies, it was obvious that kunu drinks could have provided the body with the basic nutrients that have accounted for the weight gain in this experiment<sup>14, 15</sup>. The increased in body weight observed in this experiment could be attributed mainly to the effects of the long-term consumption of the kunu drinks. Another mechanism by which Kunu drinks may have contributed to the significant increase in the body weight is by stimulating the release of insulin from the beta cells of the pancreas which may in turned increase the glucose uptake by the tissues and thereby promoting the storage of fat<sup>16, 17</sup>. Again, the protein constituents of kunu drinks may have induced the increase in body weight through the same insulin pathway by promoting the anabolic actions of insulin, which could have primed the increase in muscle mass<sup>16, 14</sup>. There was a significant ( $P < 0.05$ ) decrease in the relative brain weight (%) and a decrease in the brain weight (g) of the treated animals with Kunu drinks as compared to the control animals. Regulation of brain water content and volume is critical for maintaining the intracranial pressure within tolerable limits<sup>18</sup>. In this study, although kunu drinks significantly decreased the relative brain weight, it implies that kunu drinks could have acted as toxins to the cells of the brain<sup>18</sup>. As brain's tissues swell or shrink, the activity of the cellular transporters are approximately modified by the up or down regulations as it has been reported in the case of hyponatramia or hypernatremia<sup>18</sup>. In line with this experiment, it has been reported that long term consumption of energy drinks and zidovudine resulted in a significant ( $P < 0.05$ ) increase in the body and brain weights (g), and a significant ( $P < 0.05$ ) decrease in relative brain weight (%) of the treated adult wistar rats as compared to their corresponding control<sup>11, 19</sup>. It has been documented also that chronic administration of efavirenz resulted in a significant ( $p < 0.05$ ) decrease in the body and brain weights of adult Wistar rats<sup>20</sup>. The brain and nervous system regulate body weight and control appetite and food intake. Dietary quinine reduces body weight and food intake independent of aversive taste<sup>21</sup>. Ingestion of diets containing equal amount of quinine resulted in equivalent chronic body weight reduction, despite different diet characteristics<sup>21</sup>.

## CONCLUSION AND RECOMMENDATION

The study revealed that long-term consumption of kunu drinks could result in significant ( $p < 0.05$ ) increase in body weight and significant ( $p < 0.05$ ) decrease in relative brain weight (%) of adult Wistar rats. Further studies aimed at elucidating the kunu drinks constituents that may have acted on the weight

differences should be carried out.

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