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Research Paper

Effects of Instant Noodles Formulated Diet on Weanling Albino Rats

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Instant noodles are dried pre-cooked noodles sold with packets of seasoning powder. Noodles are used as a weaning food in high and medium income earning families in Nigeria. A twenty eight-day feeding trial was carried out to evaluate the effect of instant noodles on weanling albino rats fed at 0, 30, 50, 70 and 100% mixed with pellets. Twenty-five weanling albino rats were randomly divided into five (5) groups; the test groups consist of 5 rats each. Mean feed intake, mean body weight change, effect on organ-body weight ratio, feed conversion ratio, protein intake and protein efficiency ratio were calculated. The effects of the noodles on concentrations of triacylglycerols, high density lipoproteins, low density lipoproteins, total cholesterol, bilirubin, albumin, total protein, creatinine, urea, packed cell volume and haemoglobin were evaluated as well as the activities of alanine and aspartate transaminases and alkaline phosphatase. All figures in this study were significantly decreased ($p<0.05$) with increase in the percent of instant noodles in diet but there was a significant increase ($p<0.05$) in organ weight (kidney and liver). The results of this study have shown that instant noodles do not promote growth because it has low protein and high carbohydrate content.

Key words: Instant noodles, feeding trial, weanling albino rats, nutritional status.

INTRODUCTION

Weaning, which is the process of transitioning from milk to a solid diet for the infant plays a major role in determining the nutritional status of a child. Therefore, poor quality of weaning foods and improper weaning practices during infancy and early childhood predispose infants to malnutrition, growth retardation, impairment of cognitive and social development, reduced productivity in later life, infection, diseases and high mortality (Mohammed, 2014). Since the weaning period is the time when growth faltering and nutritional deficiencies manifest in children, this is the period when timely, adequate and balanced weaning foods should be provided. This is one of the most important and direct remedial measures to combat malnutrition (Vyas *et al.,* 2014). Ten million children under the age of 5 years old die each year (Bryce *et al.,* 2005). More than half of the deaths occur because of malnutrition. If adequate health systems were in place nearly 2/3 of the deaths could be prevented. Part of the health systems picture is to promote appropriate feeding practices for infants and young children. If at all feasible breast feeding is recommended during the first six months, the most vulnerable period for developing under-nutrition remains the transition from breast feeding to family foods.

Instant noodles (also known as instant ramen) are dried precooked noodles sold with packets of seasoning powder. Dried noodles are usually eaten after being cooked or soaked in boiling water, while precooked

noodles can be reheated or eaten straight from the packet. Instant noodles are distributed in Australia, Asia, Africa, New Zealand, the United States, Canada and European and Middle Eastern countries (WINA, 2016). It is sold throughout Indonesia, Malaysia, Australia, Nigeria, the United States, and among other numerous countries. Dried noodle is easy to make and can be eaten both as snacks, as well, a major meal. It is very versatile and this makes it attracts the patronage of majority of people both at work, in school, and at home (Shin and Kim, 2003).

Nigeria also produces instant noodles as a franchise and is the thirteenth largest consumer of instant noodles in the world (Zumdahl, 2009). Instant noodles are very popular in Nigeria and since its introduction, have had a remarkable impact on the Nigerian culinary landscape (Okoli, 2014).

Although instant noodles are consumed by all age groups in Nigeria, mothers tend to use it as the first solid food for their babies; it is also used as a weaning food; forms part of the lunch packs of many young children attending school and is consumed almost on a daily basis mostly by children in a lot of households because of its availability, easy and quick preparation (Okoli, 2014).

Instant noodles are made from wheat flour and come in a variety of brands and flavours of seasoning powder. Issues of health concern have been raised against all instant noodle brands especially in terms of nutritional value because of its high content of carbohydrates, sodium and fat (in the oil seasoning) without additional ingredients like eggs, meat and vegetables thus making it low in dietary fiber and proteins (Hope, 2011).

One other concern raised is the fact that oil which is also used in the production of instant noodles if not properly maintained can produce oxidation products and so can pose serious health risks (Gotoh, 2005; Gotoh and Shun, 2005). There is a great debate about the safety of consuming instant noodles.

Although some studies have reported the ill effects of consuming instant noodles (Gotoh *et al.,* 2006; FSSAI, 2015); there are also reports on the use of instant noodle waste which is obtained during the packaging of instant noodles in factories as part of chicken feed and as replacement for maize in the formulated diet for broiler chickens (Eniolorunda *et al.,* 2008; Omole *et al.,* 2013).This study was designed to evaluate the effect of the consumption of instant noodles wholly as a weaning food and/or as part of a normal diet.

MATERIALS AND METHODS

Chemicals and reagents

Assay kits for serum triacyglycerols, high density lipoprotein (HDL), low density lipoprotein (LDL), total cholesterol, bilirubin, albumin, total protein, creatinine and urea were obtained from Agappe Diagnostics, Switzerland. Those for alanine amino transaminase (ALT), aspartate amino transaminase (AST) and alkaline phosphatase (ALP) were obtained from Randox Laboratories Limited, UK. All chemicals were of analytical grade and were prepared in glass distilled water.

Test animals

Weanling albino rats weighing an average of 31.38±0.97 g were obtained from National Veterinary Research Institute Vom, Plateau State, Nigeria. They were housed in plastic cages and maintained under standard laboratory conditions with free access to rat pellets and tap water *ad libitum*. The research adhered to the Principles of Laboratory Animal Care National Institute of Health (NIH) publication No. 88–2959.

Instant noodles

Instant noodles were bought from Jimeta Modern Market, Adamawa State, Nigeria. Only the instant noodles were used in this study; it was removed from its sealed wrapping and milled with mortar and pestle into powder and was used directly without heating or cooking as a supplement with normal rat pellets.

Instant noodles are made from wheat flour, starch, water, salt or kansui (an alkaline salt mixture of sodium carbonate, potassium carbonate, and sodium phosphate), and other ingredients that improve the texture and flavor of noodles (Kim, 1996a).

Experimental design

Twenty-five (25) weanling rats (*Rattus novergicus*) were randomly grouped into five (5) groups. Groups A-E being the test groups consists of 5 rats each. Group A is the control group and was fed with normal rat feed. The experimental design was as follows:

(a) Group B was fed with 30 % instant noodles mixed with pellets.
(b) Group C was fed with 50 % instant noodles mixed with pellets.
(c) Group D was fed with 70 % instant noodles mixed with pellets.
(d) Group E was fed with 100 % instant noodles without seasoning.

Feeding was done for 28 days and changes in their body weights were recorded. Feed Intake (FI), Feed Conversion Ratio (FCR), Protein Intake (PI) and Protein Efficiency Ratio (PER) were calculated.

Animal sacrifice

All experimental rats were starved for 24 h prior to the day of sacrifice after the 28- day of feeding and then sacrificed using slight diethyl ether anesthesia. Blood was collected through cardiac puncture for the following analyses: triacylglycerols (TG), high density lipoproteins (HDL), low density lipoproteins (LDL), total cholesterol (TC), total bilirubin (TB), direct bilirubin (DB) albumin (ALB), total protein (TP), creatinine, urea, packed cell volume (PCV), haemoglobin (Hb), lymphocytes and neutrophils. The activities of alanine transaminase (AST), aspartate transaminase (AST) and alkaline phosphatase (ALP) were also evaluated. Whole organs were weighed immediately after sacrificing and the weights were noted and used to calculate the organ-body weight ratio.

Feed intake (FI)

This was taken as the addition of the amount of feed supplied during the experimental period.

Feed conversion ratio (FCR)

This is a numerical value used to measure the utilization of feed for growth. Feed conversion ratio was calculated following Burrell *et al.* (2000) as shown below:

$$\text{FCR} = \frac{\text{Feed Intake}}{\text{Weight gain (g)}}$$

Protein intake (PI)

This is the numerical value of the quantity of protein present in the feed and the instant noodle base that was fed to the rats during the experimental period and was determined following Sveier *et al.* (2000) as shown below:

$$\text{Protein Intake} = \text{Feed Intake} \times \text{Crude protein}$$

Protein Efficiency Ratio (PER)

This index uses growth as a measure of nutritive value of dietary protein as described by Manfred, (2012).

Liver function indices

Bilirubin was determined by the method of Walter and Gerard (1970). Serum total protein was determined according to the method of Nishi *et al.* (1985) and serum albumin was determined by the method of Doumas *et al.* (1971).

Kidney function indices

Serum urea was determined according to the method of Henry, (1963) while serum creatinine was determined as described by Allen, (1982).

Lipid profile

Serum total cholesterol, serum high density lipoprotein cholesterol, low density lipoprotein cholesterol and serum triglycerides were all determined according to the method of Friedwald *et al.* (1972).

Enzyme assays

Alkaline phosphatase activity of serum was determined as described by Wright *et al.* (1972). Alanine and Aspartate aminotransferase activities were assayed by the method described by Huang *et al.* (2006).

Organ-body weight ratio

The organ-body weight ratio was calculated using the formula below according to the method of Sellers *et al.* (2007).

$$\text{Organ-body weight ratio} = \frac{\text{weight of the organ} \times 100\%}{\text{Weight of the whole animal}}$$

Statistical analysis

The group means ± SEM for each parameter was calculated and significant differences were determined by Analysis of Variance (ANOVA) and Duncan's Multiple Range Test (DMRT) at 5% confidence level using SPSS-PC programme package (Version 22.0 SPSS Inc. Chicago, USA).

RESULTS AND DISCUSSION

The effects of instant noodle formulated-diet on final body weight, weekly feed intake, protein intake, total feed intake, protein efficiency ratio and feed conversion ratio of weanling albino rats are presented in (Table 1). Feeding weanling rats on different percentages of instant noodles caused a significant decrease ($p<0.05$) with increase of replacement percent in the final body weight

Table 1. Effects of instant noodle formulated-diet on body weights, protein intake, TFI, PER and FCR of weanling albino rats.

Parameters	Control	30%	50%	70%	100%
Initial Weight	34.94 ± 0.54^{a}	32.55 ± 3.08^{a}	32.18 ±0.58^{a}	33.08 ±2.78^{a}	31.60±2.28^{a}
Final Body Weight	105.61 ±5.15^{a}	100.58 ±11.44^{a}	80.76 ±9.74^{c}	67.99 ± 2.57^{b}	56.09 ±5.95^{b}
Weight Gain	70.68±4.63^{a}	68.03 ±8.44^{a}	48.58 ±9.18^{c}	34.91 ±0.72^{b}	24.49 ± 3.86^{b}
Weekly Weight Gain Week 1	13.09 ± 2.42^{c}	19.22 ±3.19^{ab}	20.69 ± 0.87^{ab}	8.04 ± 0.58^{b}	22.98 ± 3.03^{a}
Weekly Weight Gain Week 2	16.06 ± 1.88 ^{a}	15.34 ± 3.18^{ab}	6.80 ± 0.17^{bc}	12.10 ±2.17^{ab}	1.20 ±0.39^{c}
Weekly Weight Gain Week 3	23.11 ±1.87^{a}	20.12 ±2.49^{ab}	11.33 ±3.54^{bc}	5.89 ±0.57^{cd}	0.33 ± 1.26^{d}
Weekly Weight Gain Week 4	18.41 ± 1.85^{a}	13.35 ± 0.98^{ab}	9.77 ±0.81^{b}	8.89 ± 1.62^{b}	-0.02 ± 0.95^{c}
Weekly Feed Intake Week 1	35.33 ± 0.77^{c}	76.52 ± 7.24^{a}	59.88 ±1.08^{b}	45.26 ± 3.80^{bc}	53.41 ±5.64^{b}
Weekly Feed Intake Week 2	54.20 ±4.04^{ab}	70.21 ±8.50^{a}	53.64 ±1.32^{ab}	57.31 ±1.87^{ab}	36.07 ±3.82^{b}
Weekly Feed Intake Week 3	85.93 ±7.41^{b}	119.80 ±8.04 ^{a}	73.97 ±5.43^{b}	50.25 ±8.56^{c}	19.78 ±2.08^{d}
Weekly Feed Intake Week 4	82.89 ± 6.37^{a}	98.79 ± 12.65^{a}	70.28 ±7.37^{a}	37.34 ± 7.17^{b}	20.82 ±2.41^{b}
Total Feed Intake (TFI)	258.36 ±18.30^{b}	365.32 ±35.66^{a}	257.76 ±4.95^{b}	190.15 ± 13.53^{bc}	130.09 ±13.45^{c}
Protein Intake (PI)	49.32 ± 2.75^{a}	38.75 ± 4.81^{b}	32.22 ± 1.87^{b}	21.87 ± 3.51^{c}	13.01 ±1.35^{c}
Feed Conversion Ratio (FCR)	3.66 ± 0.10^{a}	5.45 ± 0.17^{a}	5.88 ± 0.84^{a}	7.27 ± 1.91^{a}	5.81 ± 0.74^{a}
Protein Efficiency Ratio (PER)	1.83 ± 0.05^{a}	1.81 ± 0.18^{a}	1.47 ±0.39^{b}	1.47 ±0.27^{b}	1.36 ±0.04^{b}

Values are means of five replicates ± SEM. Values with different superscripts in the same row are significantly different from each other ($p<0.05$).

Table 2. Effects of instant noodle formulated-diet on organ-body weight ratio of weanling albino rats.

Groups	Liver (g)	Kidney (g)
1. Control	4.94 ± 0.13^{a}	0.96 ± 0.04^{a}
2. 30% Instant Noodle	4.74 ± 0.21^{a}	0.90 ± 0.05^{a}
3. 50% Instant Noodle	4.95 ± 0.18^{a}	0.98 ± 0.05^{a}
4. 70% Instant Noodle	4.94 ± 0.25^{a}	1.04 ± 0.06^{ab}
5. 100% Instant Noodle	5.46 ± 0.23^{b}	1.19 ± 0.07^{b}

Values are means of five replicates ±SEM. Means in the same column with different superscripts are significantly different ($p<0.05$).

of animals compared to control. This decrease is an indication that supplementation with instant noodles did not support growth because a typical serving of noodles contains a very low amount of protein-typically 1-3% (Park and Baik, 2004a) compared to the pellets fed to animals in the control group (Igwilo *et al.,* 2013). The pellets used wholly and in supplementation with instant noodles in this study is the growers mash which contains yellow and white maize, rice bran, wheat offal and guinea corn as sources of carbohydrates and also contains palm kernel cake, coconut cake, bean meal, groundnut cake, pigeon pea, blood meal, cotton seed meal and fish meal which are sources of proteins, lipids and some vitamins. The pellets also contain bone meal and common salt which provides minerals salts like sodium, iodine, calcium and phosphorus (Grand cereals, 2015). Protein efficiency ratio (PER) is the ability to support growth in young rapidly growing animals. The low PER observed with increase in instant noodle supplementation is an indication of poor protein content of the diet (Nwala *et al.,* 2013; Alagbaoso *et al.,* 2015). Several studies have identified gaps in the nutritional value of instant noodles and have suggested fortification of an instant noodle diet by improvement of formulation to enable it meet all nutritional requirements (Bui and Small, 2007d; Aydin and Gocmen, 2011; Gulia *et al.,* 2014). Suggested improvements include the fortification of wheat flour used in making instant noodles through the addition of soya and other legume flour, barley, milk casein and some vitamins (Van Hung *et al.,* 2007). Sudha *et al.* (2011) reported the inclusion of defatted soy flour and whey protein concentrate in instant vermicelli as a fortification which not only enhanced their protein content and *in vitro* protein digestibility but also reduced the fat uptake in noodles. Khetarpaul and Goyal (2007) also reported that protein content and quality can be improved in noodles by incorporation of soy, sorghum, maize, and rice at 10% level without significantly affecting overall acceptability of the product.

The effects of instant noodle formulated-diet on the organ body weight ratio of weanling albino rats are shown in (Table 2). There was a significant increase ($p<0.05$) in the organ weight of both the liver and kidney in the group given 100% instant noodles compared to control and the other percentages and also a significant increase ($p<0.05$) in the organ weight of the kidney in the group

Table 3. Effects of instant noodle formulated-diet on liver function indices of weanling albino rats.

Groups	ALT(U/l)	AST(U/l)	ALP(U/l)	DB (mg/dl)	TB (mg/dl)	ALB (g/dl)	TP (g/dl)
Control	28.13±1.20^{a}	28.00±1.66^{a}	283.00±31.09^{a}	0.25±0.10^{a}	0.17±0.03^{a}	2.75±0.11^{a}	4.43 ± 0.31^{a}
30% Instant Noodle	22.00±1.66^{b}	24.00±1.66^{a}	296.70±17.93^{a}	0.25±0.06^{a}	0.14 ± 0.02^{a}	2.45 ± 0.03^{a}	4.41 ± 0.31^{a}
50% Instant Noodle	25.00±1.41^{b}	44.00±1.50^{c}	388.70±18.01^{a}	0.24 ± 0.00^{a}	0.15 ± 0.00^{a}	2.31 ± 0.11^{a}	4.28 ± 0.47^{a}
70% Instant Noodle	24.00±1.50^{b}	18.25±0.65^{b}	370.40±13.94^{a}	0.29±0.00^{a}	0.17 ± 0.03^{a}	2.73±0.60^{a}	4.60 ± 0.32^{a}
100% Instant Noodle	24.00±0.87^{b}	19.25±1.24^{b}	333.50±23.99^{a}	0.33±0.03^{a}	0.19 ± 0.02^{a}	2.03 ± 0.11^{b}	3.65 ± 0.59^{b}

Values are means of five replicates ± SEM. Means in the same column with different superscripts are significantly different (p<0.05).

Table 4. Effects of instant noodle formulated-diet on serum lipid profile of weanling albino rats.

Groups	TC (mg/dl)	TG (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Control	162.85 ± 3.13^{a}	40.00 ± 7.89^{a}	50.00 ± 5.39^{a}	65.12 ± 9.04^{a}
30 % Instant Noodle	162.84±6.00^{a}	78.43±10.79^{b}	48.50 ± 5.40^{a}	70.15± 10.98^{b}
50 % Instant Noodle	183.90 ± 8.00^{b}	86.57 ± 2.15^{b}	43.23 ± 2.14^{b}	76.97 ± 10.36^{b}
70% Instant Noodle	192.08 ± 10.82^{b}	90.14 ± 3.00^{b}	42.00 ± 3.54^{b}	77.20 ± 11.15^{b}
100% Instant Noodle	196.64±10.86^{b}	93.50 ± 4.24^{b}	40.00 ± 1.47^{b}	79.32 ± 4.80^{b}

Values are means of five replicates ±SEM. Means in the same column with different superscripts are significantly different (p<0.05).

fed with 70% instant noodle supplemented diet. An increase in organ-body weight ratio is an indication of inflammation (Moore and Dally, 1999). It has been reported that an increase in the liver weight of animals is a common sign of induced toxicity as a result of induction of liver enzymes which could be due to a marked proliferation of the smooth endoplasmic reticulum (Anozie and Onwurah, 2001). The increase in kidney weight is suggestive of nephropathy (Ijeh and Obidoa, 2001).

Defects to metabolic routes could be possible reasons for causes of several diseases of which hypo activity, hyperactivity and inhibition of metabolic enzymes are enormously involved. Increase or decrease in the activity of these metabolic enzymes serves as biomarkers for clinical diagnosis of some illness (Ejembi and Sanni, 2012). Table 3 shows the effects of instant noodles formulated-diet on liver function indices of weanling albino rats. Feeding with the various formulated diets significantly reduced (p<0.05) the activity of alanine transaminase (ALT) compared to control. The activity of aspartate transaminase (AST) was significantly reduced (p<0.05) in the groups fed with 100 and 70% instant noodles and increased significantly (p<0.05) in the group fed with 50% compared to control. There was a significant reduction (p<0.05) in the concentration of albumin and total protein in the group fed 100% instant noodles compared to control. There no significant change (p>0.05) in the activity of alkaline phosphatase and the concentration of direct and total bilirubin compared to control. Biochemical parameters like enzyme assays indicate that cellular damages could be by conventional historical techniques (Akanji, 1986; Akanji and Ngaha, 1989). Activities of ALT and AST in the serum are markers of liver injury (Milinkovic-Tuv *et al.,* 2005). Changes in the activities of these enzymes indicate injury to organelles such as mitochondria leading to release of soluble enzymes like AST (Dahiru *et al.,* 2003). Concentrations of albumin, bilirubin and total protein in the blood can indicate the functional state of the liver (Ganong, 2006). Albumin in conjunction with other plasma proteins exerts a colloidal osmotic pressure which serves to maintain a normal blood volume. Thus, the decrease in serum albumin and protein concentration might be due to a diminished synthetic function of the liver (Adebayo *et al.,* 2009). Table 4 shows the results effects of instant noodle formulated-diet on lipid profile indices of weanling albino rats. There was a significant increase (p<0.05) in the concentration of total cholesterol, triacylglycerols and low density lipoproteins at higher percentages of instant noodle supplementation while the concentration of high density lipoproteins was significantly reduced (p<0.05) compared to control. The major serum lipids include cholesterol, low density lipoprotein-cholesterol (LDL-c), high density lipoprotein-cholesterol (HDL-c) and triacylglycerols. Any alteration in the concentration of these lipids can give useful information to the predisposition of subjects to atherosclerosis and coronary heart disease (Abolaji *et al.,* 2007). Studies have shown that diets high in fibre have the ability to bind cholesterol because dietary fibre reduces the concentration of both cholesterol and triacylglycerols (Tai *et al.,* 2009). The increase in the cholesterol concentration especially in the group fed with 100% instant noodles is due to the absence of fibre in the formulated diet. HDL-c transports excess or unused cholesterol from the tissues back to the liver, where it is

Table 5. Effects of instant noodle formulated-diet on the concentration of serum urea and creatinine of weanling albino rats.

Group	Creatinine (mg/dl)	Urea (mg/dl)
1. Control	2.72 ± 0.05[a]	100.18 ± 9.91[a]
2. 30% Instant Noodle	2.60 ± 0.07[a]	99.19. ± 9.91[a]
3. 50% Instant Noodle	2.57 ± 0.11[a]	99.09± 8.58[a]
4. 70% Instant Noodle	2.57 ± 0.11[a]	97.27 ± 9.91[a]
5. 100% Instant Noodle	2.43 ± 0.05[a]	96.09 ± 0.00[a]

Values are means of five replicates ± SEM. Means in the same column with different superscripts are significantly different ($p<0.05$).

Table 6. Effects of instant-noodle formulated-diet on packed cell volume and haemoglobin concentration of weanling albino rats.

Groups	PCV (%)	Haemoglobin (g/L)
1. Control	44.25 ± 1.67[a]	13.41 ± 0.56[a]
2. 30% Instant noodle	41.75 ± 1.88[ab]	12.65 ± 0.63[ab]
3. 50% Instant noodle	40.50 ± 0.43[b]	12.27 ± 0.15[b]
4. 70% Instant noodle	40.00 ± 1.97[b]	12.10 ± 0.66[b]
5. 100% Instant noodle	38.50 ± 3.90[b]	11.74 ± 0.65[b]

Values are means of five replicates ±SEM. Means in the same column with different superscripts are significantly different ($p<0.05$).

broken down to bile acids and is then excreted making it beneficial (Adebayo *et al.,* 2011). The significant reduction of HDL-c in the groups fed with higher supplementation of instant noodles will negate this beneficial effect.

Table 5 shows effects of instant noodle formulated-diet on the concentration of serum urea and creatinine of weanling albino rats. Although there was a slight decrease in both parameters compared to control, the decrease was not significantly different ($p>0.05$). Renal function indices are used to assess the normal functioning capacity of the different parts of the nephron (Guyton and Hall, 2006). Urea excretion by the kidney is the primary method of nitrogen excretion while creatinine, a catabolic product of muscle is a useful index of assessing the functional capacity of the glomerular and tubular regions of the nephrons and low levels are seen in some types of liver disease and diets that are very low in protein (Go *et al.,* 2004).

Table 6 shows the effects of instant noodle formulated-diet on packed cell volume and haemoglobin of weanling albino rats. There was a significant decrease ($p<0.05$) in the percentage of packed cell volume and haemoglobin concentration with increase in instant noodle supplementation compared to control. The packed cell volume is the volume of red blood cells in a liter of blood. Its measurement gives the percentage of red blood cells in whole blood while haemoglobin is the red respiratory pigment of red blood cells (Guyton and Hall, 2006). Assessment of these parameters can be used in determining the effect of food and drugs on the blood. The low PCV and haemoglobin count seen especially in the group fed with 100% instant noodles may be due to the low protein intake of that group and considering the role red blood cells and haemoglobin play in transferring respiratory gases, the observed decrease maybe detrimental.

Conclusion

The results of this study have shown that instant noodles do not promote growth because it has low protein and high carbohydrate content. Although fortification of instant noodles by manufacturers is currently advocated, it is not mandatory and as such not all manufacturers adhere to it. Therefore, babies that are weaned with only instant noodles without any protein supplement might yield to protein energy malnutrition. It is therefore recommended that mothers should use more proteinous weaning foods other than instant noodle or complement instant noodles with other proteinous foods such as eggs, meat and vegetables to make up for the reported nutritional deficiencies of instant noodles.

AUTHOR`S DECLARATION

We declare that this study is an original research by our research team and we agree to publish it in the Journal.

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