ISSN-0976-0245 (Print) • ISSN-0976-5506 (Electronic)

Volume 11 | Number 04 | April 2020

Indian Journal of Public Health Research & Development

An International Journal

Website:
www.ijphrd.com

Indian Journal of Public Health Research & Development

Print-ISSN: 0976-0245-Electronic-ISSN: 0976-5506, Frequency: Quarterly (Four issues per volume)

Indian Journal of Public Health Research & Development is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned International Standards Serial Number (ISSN) and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases. The journal is covered by EBSCO (USA), Embase, EMCare. The journal is now part of DST, CSIR, and UGC consortia.

Website : www.ijphrd.com

Editor

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Efficacy of Local Food-Based Tabaro dange Against Weight of Gain and Levels of Hemoglobin (Hb) White Rats (Rattus Norvegicus Strain Wistar)

Jenita Frisilia[1], Annis Catur Adi[2], Rita Ismawati[3]

[1]Student Master of Public Health at Airlangga University Surabaya, [2]Department of Nutrition, Faculty of of Public Health, Airlangga University Surabaya, [3]Department of Family Welfare Education, Faculty of Engineering, Surabaya State University, Indonesia, 60115

Abstract

Disasters can cause blocked logistical access locations. This causes special disaster victims for children to be difficult to get food, as a result, the nutritional intake for the growth and development of infants cannot be met according to their needs. Utilization of local food can be an alternative in providing emergency food that is rich in energy needs to prevent the expenditure of malnutrition. This study aims to determine the effectiveness of the administration of Tabaro on body weight and levels of white rats (rattus norvegicus). This research is experimental with a randomized design post-test only control group design. Randomly selected samples (CRD) were divided into 4 groups, as much as 4 g/rat/day, each maintained by individuals for 14 (fourteen) days. The sample used was 24 male white rats (Rattus norvegicus). Statistical test results showed an increase in body weight in each group with a p-value <0.05 ($\alpha = 0.054$) and a significant increase in Hb levels in each group that managed a p-value <0.05 ($\alpha = 0.001$). Giving Tabaro dange snacks based on local food can increase body weight and hemoglobin levels in male white rats (Rattus norvegicus). Obtained from further research to learn about the acceptability of the Tabaro dange can be used as a rationed product in an emergency.

Keyword: *Body weight, hemoglobin (Hb) levels, local food, tabaro dange.*

Introduction

Most of Indonesia's territory is in disaster-prone locations. This can lead to blocked access to food so that the impact of disaster victims has decreased nutritional status due to lack of energy for quality food.() Not all regions in Indonesia have good infrastructure and make it easy for people to access good and healthy food.

Foods not only contain macronutrients such as carbohydrates, fats and proteins that can produce energy but also contain micronutrients such as vitamins and minerals.() Lack of food intake, in the long run, will also cause a lack of micronutrient intake or micronutrient deficiencies. The condition that often accompanies protein and micronutrient energy malnutrition is anemia. Anemia is a state of decreased levels of hemoglobin (Hb), hematocrit (Ht) and red blood cells below normal values. () Contain nutritional needs to meet the daily consumption requirements for toddlers (1125-1600 kcal/day) in order to avoid new disasters after natural disasters, such as the emergence of hunger, so that emergency food must be given at least meet the additional food needs of 10-15% of the nutritional adequacy rate (RDA) for infants.()

Emergency food is given aiming to prevent disease and even death due to starvation during disasters.() One alternative to deal with cases of malnutrition in an emergency is to use Moringa leaves as an alternative

Corresponding Author:
Jenita Frisilia
Student Master of Public Health at Airlangga University Surabaya, Indonesia, 60115
e-mail: jenita.frisilia-2017@fkm.unair.ac.id

food. One of the uses of Moringa leaves is processed into a traditional snack based on local food. Tabaro dange is a typical hammer food based on local food that can be used as food "ready to use food". Tabaro dange is made from a mixture of sago flour, cassava flour and grated coconut served with additional contents in it, such as brown sugar and anchovies.() Because tabaro dange is made from sago flour and cassava flour so it is rich in carbohydrates which can contribute energy to meet calorie needs in an emergency.

Various types of emergency food have been developed using local food. Based on the background description, this study aims to prove whether the administration of tabaro dange can increase body weight and hemoglobin levels during the treatment process of body weight of rats (Rattus norvegicus).

Method

The study was conducted in the biochemistry laboratory of the Faculty of Medicine, Airlangga University on July 11 to August 7, 2019. The type of research used was a randomized post-test only control group design where randomly selected samples (CRD) were divided into 4 groups, consisting of 1 control group, namely the control (K) and 3 treatment groups namely P1, P2 and P3. The giving of Tabaro dange starts on the 1st day after the adaptation period for one week until the 14th day. The research design is presented in Figure 1.

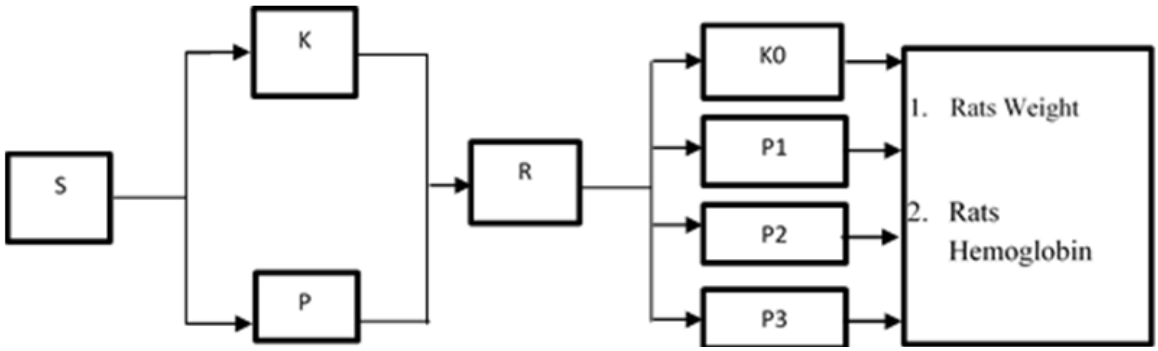

Figure 1. Experimental Research Design

Information:

S : Experimental animal (white rat Galur Wistar)
K : Control Group
P : Treatment group
R : Grouping rats by random sampling
K0 : Control group (pellet administration)
P1 : Tabaro dange based on
P2 : Provision of Tabaro and substitute purple sweet potato flour and Moringa leaf
P3 : Tabaro administration with yellow sweet potato flour and purple sweet potato and moringa leaf substitution

The experimental unit used in this study was a male white rat (Rattus norvegicus) male Wistar strain aged 3-4 months with body weight around 150-200 grams, with the inclusion criteria there were no anatomical abnormalities that appeared healthy. With replication 6 times. To overcome if there is an error in the study, a sample reserve is needed. To anticipate the loss of the dining experiment unit a correction is performed with 1/(1-f) where f is the proportion of the experimental unit that dies or fails. In this study using f = 10%.

Rats were grouped into two groups randomly, namely the control group and the treatment group. The control group was given standard feed and the treatment group was divided into three groups that were given the Tabaro dange snack bar (P1), the group that was given the Tabaro dange snack bar substitute purple sweet potato flour and Moringa (P2) and the group who were given the Tabaro dange snackbar substitution of yellow sweet potato flour and Moringa (P3). The gift starts on the 8th day after the adaptation period. Giving food and drinks ad libitum and giving Tabaro dange is done orally by feeding the rats, with the time of administration every day for 2 weeks.

The following is the treatment for each group. Control group (K0): feeding pellets. Treatment Group

1 (P1): administration of Tabaro dange F0: Sago 44g (40%), grated coconut 42g (38,18%), cassava 6g (5,45%), brown sugar 13g (7,26%) and anchovies 10g (9,09%) per 4 g/day. Treatment group 2 (P2): granting Tabaro dange F2: Sago 40g (36,36%), grated coconut 42g (38,18%), cassava 2g (1,28%), brown sugar 13g (7,26%), anchovy 10g (9,09%), purple sweet potato 4g (3,64%) and Moringa 4g (3,64%) per 4 g/day. Treatment group 3 (P3): administration of Tabaro dange F3: Sago 38g (34,55%), grated coconut 42g (38,18%), cassava 2g (1,28%), brown sugar 13g (7,26%), anchovy 10g (9,09%), yellow sweet potato (1.82%), purple sweet potato 2g (1,82%) and Moringa 6 g (5,45%) per 4 g/day.

Measurements of body weight of rats carried out on day 7 (before intervention), day k-14 and day 21 after the intervention was given using a digital scale with a level of accuracy of 0,01 kg. Measurement of hemoglobin levels was carried out by the Cyanmethaemoglobin method by taking blood through the rat's tail. Reference to normal Hb levels in mice following physiological values in male rats, which is 13,2-16,4 g/dL.[1] Data were processed statistically using SPSS 24 with data analysis using repeated measures for body weight and kruskall-wallis for Hb data.

Results

Efficacy of Tabaro dange on Weight Loss in White Rats (Rattus norvegicus): Preliminary weight data of rats is weight data before treatment and weight data after treatment is data for the 7th day and 14th day, weighed using a cannary scale digital scale in grams. Data on the average weight gain of white rats (rattus norvegicus) before and after treatment can be seen in Table 1.

Table 1 The average weight of white rat (rattus norvegicus strain wistar) before and after the treatment (grams)

Weight	K0 (Control)	Q1 (F0)	P2 (F2)	Q3 (F3)	p value
Beginning	202,5±8,5	2045±6,7	203,68±6,6	203,5±8,5	0,054
7 days	237,3±44	2386±4,1	239,1±4,9	239,6±4,4	
14 days	257,3±2,8	263,0±1,8	267,6±1,2	275,0±3,03	

The mean weight of all samples before treatment was 203,5±7,1 gram with a weight range between 192-211 grams. The mean weight of all samples of the 7th day after the treatment was 238,7±4,2 gram with a weight range between 232-245 grams. The average weight of the entire sample 14 days after treatment was 265,7±6,9 grams with a range of body weight between 254-281 grams.

Statistical test results showed that there were significant differences between initial body weight, day 7 body weight and day 14 rats (Rattus norvegicus) given the Tabaro dange intervention. Rats' weight gain after day 7 and day 14, respectively, reduced the body weight of rats before treatment. Data on the average weight gain of mice can be presented in table 2.

Table 2: Average weight gain of white rats (Rattus norvegicus) after treatment (grams)

Weight	K0 (Control)	Q1 (F0)	P2 (F2)	Q3 (F3)
7th day	20,0±2,8	27,6±1,7	30,1±1,6	36,3±4,6
14th day	54,8±6,2	58,5±5,6	64,0±5,5	71,6±7,2

Weight gain in rats due to the provision of high Dange Tabaro snacks will carbohydrate, protein, fat and energy to meet the needs of the mice to the growth process. The energy content in Tabaro dange can be seen in Table 3.

Table 3: Nutrient Content of Tabaro Formulations Dange

Material	Formulation		
	F0	F1	F2
Energy (Kcal)*	308,58	310,19	305,93
Carbohydrates (%)**	6833	67,04	66,12
Protein (%)***	6,07	8,76	854
Fat (%)****	1,22	0,87	0,81
Fe (%)	2,11	5,42	6,82
Vitamin C	0,02	0,04	0,6

Source: Primary Data, 2019

* 233 kcal energy, ** Total Carbohydrates 7-11 g (12-20% of total calories, *** Protein 7,9 g (10-15% of total calories, **** Fat 9,1 g 35% of total calories

The energy content in each tabaro dange formulation has met the emergency food requirements with the highest energy value contained in the F2 formulation of 310,19 kcal. The main source of energy is in carbohydrates, but fats and proteins can also contribute energy through the oxidation process of nutrients.[8] Carbohydrate content in an emergency food product is very important to meet calorie adequacy.[9] In addition to carbohydrates, fat content in emergency foods has an important contribution, namely as one of the energy contributors.[10]

Efficacy of Tabaro dange on Increased Hemoglobin (Hb) White Rat (Rattus norvegicus strain wistar) **Male**

Hemoglobin is a protein that has iron content and plays an important role in transporting oxygen and circulating it throughout the body's tissues.[8] In this study hemoglobin was measured before the intervention was established and after the intervention was given to experimental animals. Data on average hemoglobin levels before and after the intervention are presented in table 4.

Table 4 Average Hemoglobin (Hb) Levels in Experimental Rats

Variable	Group	N	Mean ± SD (g)	Min	Max	P-value
Early Hb	K1	6	8.0667 ± 1.83485	6.40	11.40	0.143
	Q1	6	6.9333 ± 0.48854	6.40	7.50	
	P2	6	7.7333 ± 0.56451	7,10	8.60	
	Q3	6	6.9667 ± 0.37238	6.40	7.40	
Final HB	K1	6	14.3167 ± 1.03618	12,90	15.60	0.001
	Q1	6	15.7000 ± 2.41578	12,20	19.50	
	P2	6	18,0333 ± 1,23882	16.50	19,20	
	Q3	6	23,2333 ± 3,53817	19.40	27.70	
Change in Hb	K1	6	6,2500 ± 2,54617	2.40	9.00	0,000
	Q1	6	8.7667 ± 2.29666	5.80	12.30	
	P2	6	10.3000 ± 0.86487	9.30	11.50	
	Q3	6	16.2667 ± 3.60648	12.30	20.90	

Table 4 shows that the average level of the highest hemoglobin rat (Rattus norvegicus) before the treatment does not have a noticeable difference. ANOVA test results showed that there were significant differences between the initial body weight of rats (Rattus norvegicus) before and after the intervention was given.

Discussion

Weight gain is natural because rats are animals that never stop growing, where the speed of growth will decrease when reaching adulthood.[11] The results showed there were differences in body weight of rats before and after the intervention in the treatment group. One of the factors that increase growth is the intake of food provided in sufficient quantities with the nutritional content contained in these foods.[8] All rats received the same ration, but there were different treatments for the amount of energy contained in the feed. The increase in body weight of mice that received higher F2 compared to other treatments. This is because the Protein content in F2 is higher than other formulas, although the energy content in F2 is lower compared to other formulas, the total energy is sufficient to meet the energy requirements of 10-15% of the AKG.[12] In the phase of protein, growth plays a very important role, because in that phase the process of biosynthesis takes place quickly, especially the formation of body protein, while energy is needed for the ongoing process of the body's metabolism.

Efficacy of Tabaro dange on Increased Hemoglobin (Hb) White Rat (Rattus norvegicus)

Nutrient intake of protein, iron, vitamin A and vitamin C can affect hemoglobin levels. Protein plays an important role in the transportation of iron in the body. Lack of protein intake in the body will be able to lead the transportation of iron deficiency and iron hampered. The lower the protein intake and iron intake, the lower the hemoglobin level.[13]

Vitamin C increases non- heme iron absorption.[14] The presence of vitamin C from Moringa accelerates the absorption of iron in the non-heme form. Iron non-heme by the reduction of ferric iron into Ferro in the small intestine so easily absorbed. The formation of hemosiderin which is difficult to mobilize to free iron can be inhibited by vitamin C. So that it can reduce the risk of iron deficiency anemia.[15]

Vitamin A affects the release of iron from the liver. Supplementation of vitamin A with iron improves vitamin A status and improves iron status.[16] The limitation of this study is that the initial hemoglobin levels were not uniform in all groups of rats to be treated.

The results showed that the administration of local food-based Tabaro dange can increase Hb levels in white rats. The content of protein, iron, vitamin A and vitamin C in Tabaro dange will affect the absorption of globin and iron proteins that can meet the needs of heme. The results of other studies indicate there is a positive relationship between the intake of iron with high levels of hemoglobin.[17]

Conclusion

Local food-based Tabaro dange snacks can increase body weight and hemoglobin levels in male white rats (*Rattus norvegicus*).

SUGGESTION

Further research is needed to determine the acceptability of Tabaro dange snacks so that they can be used as ration products in an emergency.

Acknowledgements : On this occasion, the authors would like to thank the head of the nutrition laboratory of the Faculty of Public Health and the Biochemical Laboratory of the Faculty of Medicine Airlangga University and parents who have provided moral and material support for the research and preparation of this article.

Conflict of Interest: The author states that there is no conflict of interest regarding the publication of this article.

Source of Funding: Personal researcher.

Ethical Clearance: This study was conducted after obtaining a Certificate of Ethical Feasibility from the Health Research Ethics Commission of the Faculty of Health, Airlangga University Number: 189/EA/KEPK/2019.

References

1. Almatsier S. Prinsip Dasar Ilmu Gizi. Jakarta: PT Gramedia Pustaka Utama; 2010.
2. Inggita Kusumastuty, Laily Fandianty Ningsih ARJ. Formulasi Food Bar Tepung Bekatul dan Tepung Jagung sebagai Pangan Darurat [Internet]. 2015;2(2):68–75. Available from: https://ijhn.ub.ac.id/index.php/ijhn/article/viewFile/120/139
3. Institute of Medicine. Dietary Reference Intakes. 2002. 271-281 p.
4. Adriani Merry dan Wirjatmadi Bambang. Peranan Gizi dalam Siklus Kehidupan. 1st ed. Suwito, editor. Jakarta: Kencana Prenadamedia Group; 2012. 162-216 p.

5. Semba RD, Bloem M. The anemia of vitamin A deficiency : epidemiology and pathogenesis [Internet]. 2002;2:271–81. Available from: https://www.nature.com/articles/1601320.pdf
6. Agus Hendra Al Rahmad. Pengaruh Asupan Protein dan Zat Besi (Fe) terhadap Kadar Hemoglobin pada Wanita Bekerja [Internet]. 2015;8(3):321–5. Available from: https://ejurnal.poltekkes-tjk.ac.id/index.php/JK/article/view/509/565%0A%0A
7. Tuti Anggriani Utama, Nora Listiana DS. Comparison Effect of Iron with and without Vitamin C to Age Hemoglobin Levels among Women of Reproductive Age [Internet]. 2013;8:344–8. Available from: http://journal.fkm.ui.ac.id/kesmas/article/view/19/20
8. Guntur Argana, Utari, Kusharisupeni DMU. Vitamin C sebagai faktor dominan untuk kadar hemoglobin pada wanita usia 20 - 35 tahun [Internet]. 2004;23(1):6–14. Available from: https://univmed.org/wp-content/uploads/2011/02/Guntur.pdf
9. Endi Ridwan. Kajian Interaksi Zat Besi Dengan Zat Gizi Mikro Lain Dalam Suplementasi (Review Of Interactions Between Iron And Other Micronutrients In Supplementation) [Internet]. 2012;35(1):49–54. Available from: http://ejournal.litbang.depkes.go.id/index.php/pgm/article/view/3083/3051
10. Marissa Anggraini, Evawany Y Aritonang ZL. Hubungan Pola Konsumsi Pangan Dengan Kadar Hemoglobin Pada Ibu Hamil Trimester Ketiga Di Wilayah Kerja Puskesmas Desa Lalang Kecamatan Medan Sunggal Tahun 2013 [Internet]. 2013;(2004):1–8. Available from: https://jurnal.usu.ac.id/index.php/gkre/article/view/5173/2783