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Line Spread Test Results

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Highlights

White Rice Porridge with Egg

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Discovering Thoughts, Inventing Future

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CONTENTS OF THE ISSUE

- i. Copyright Notice
- ii. Editorial Board Members
- iii. Chief Author and Dean
- iv. Contents of the Issue
1. Line Spread Test Results for Commercially Available the White Rice Porridge with Salted Plum - Including the Effect of Four Types of Thickening Agents Added After Blending. *1-4*
2. Line Spread Test Results for Commercially Available the White Rice Porridge with Egg - Including the Effect of Four Types of Thickening Agents Added After Blending. *5-8*
3. Diagnosis and Treatment of Severely Malnourished Children in Outpatient Therapeutic Program. *9-14*
4. Risk Factors for Chronic Malnutrition in Children Aged 6 to 23 Months in Bopa, Southwest Benin. *15-23*
5. Addressing Comorbid Anxiety in Family-Based Treatment for Adolescent Anorexia Nervosa: User Experiences and Perspectives. *25-32*
- v. Fellows
- vi. Auxiliary Memberships
- vii. Preferred Author Guidelines
- viii. Index



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Line Spread Test Results for Commercially Available the White Rice Porridge with Salted Plum - Including the Effect of Four Types of Thickening Agents Added after Blending -

By Naomi Katayama, Shoko Kondo & Mayumi Hirabayashi

Nagoya Women's University

Abstract- We added four commercially available thickeners to white rice porridge with salty plum, which is popular in Japan, and compared the viscosity. Porridge containing water is useful even in the event of a disaster. In Japan, porridge is useful as a stockpile of food during disasters. Porridge is used as a meal of a wide range of age groups, from the elderly to infants. However, if porridge is made into a liquid using a mixer, etc., it becomes a food with a high risk of aspiration for people with impaired swallowing function. Therefore, it is necessary to add a thickener to the liquid porridge to increase its viscosity. In order to keep the consistency, the thickening agent should be changed according to the amount of nutrients contained in the porridge.

Keywords: commercial product, white rice porridge with salted plum, line spread test (LST), thickener.

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Line Spread Test Results for Commercially Available the White Rice Porridge with Salted Plum - Including the Effect of Four Types of Thickening Agents Added After Blending -

Naomi Katayama ^α, Shoko Kondo ^σ & Mayumi Hirabayashi ^ρ

Abstract- We added four commercially available thickeners to white rice porridge with salty plum, which is popular in Japan, and compared the viscosity. Porridge containing water is useful even in the event of a disaster. In Japan, porridge is useful as a stockpile of food during disasters. Porridge is used as a meal of a wide range of age groups, from the elderly to infants. However, if porridge is made into a liquid using a mixer, etc., it becomes a food with a high risk of aspiration for people with impaired swallowing function. Therefore, it is necessary to add a thickener to the liquid porridge to increase its viscosity. In order to keep the consistency, the thickening agent should be changed according to the amount of nutrients contained in the porridge. As a result, viscosity was stable in the order of Thickener D(dextrin, Polysaccharide thickener, and calcium lactate), B(dextrin, xanthan gum, tri-sodium chloride, calcium lactate), A(dextrin, polysaccharide thickener, potassium chloride, sucralose as sweetener), and C(dextrin, water-soluble dietary fiber, xanthan gum as thickener). A thickener containing dextrin and calcium lactate was compatible with porridge and stabilized the viscosity. In order to prepare for disasters, it is necessary to stockpile thickeners suitable for porridge.

Keywords: commercial product, white rice porridge with salted plum, lin spread test (LST), thickener.

I. INTRODUCTION

In recent years, various disasters have occurred in Japan. In this case, disaster food that is stockpiled will be used. It is difficult to provide meals in a state

where lifelines are cut, and there is no water, gas, or electricity. At that time, porridge containing water is helpful. White rice porridge is widely available as nursing care food for the elderly and baby food for infants. However, porridge can cause aspiration pneumonia in people with impaired swallowing ability.

In order for people with impaired swallowing function to eat porridge safely, it is necessary to add a thickener suitable for the porridge. We reported that using porridge made by adding salted plum (umeboshi) to white rice, which is very popular in Japan, the viscosity measured by adding four types of thickening agents to porridge.

II. MATERIALS AND METHODS

The nutritional components of the white rice porridge with salted plum used in this experiment are shown in Table 1. The white rice porridge with salty plum used had 36.00 kcal, 0.6g of protein, 0.12g of Fat, 8.2g of carbohydrate, and 0.36-0.84g of sodium per 100g (displayed on the product packaging).

Table 1. Contents and nutritional value of commercial porridge

Contents		Nutrient contents (Per 100g)				
		Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Sodium (mg)
White rice porridge with salted plum	Non-glutinous rice,	36	0.6	0.12	8.2	0.36~0.84

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Table 2 shows the content and nutritional value of four commercially available thickeners. Main component of all thickeners was dextrin (displayed on the product packaging).

Table 2 Content and nutritional value of four types of thickeners

Contents		Nutrient contents (Per 2g)					Sodium (m g)
		Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)		
					Sugar (g)	Dietary fiber (g)	
A	Dextrin、Polysaccharide thickener、potassium chloride、sweetener (Sucralose)	5.27	0.00	0.00	0.87	0.47	10.67
B	Dextrin、Xanthan gum、Trisodium chloride、Calcium lactate	4.00	0.00	0.00	1.00	0.70	3.00
C	Dextrin、Water-soluble dietary fiber、Thickener (Xanthan gum)	5.40	0.00	0.00	1.36	0.50	12.33
D	Dextrin、Polysaccharide thickener、Calcium lactate	0.53	0.03	0.00	0.91	0.83	24.00

a) *Sample (food with Thickener added) adjustment*

Samples were adjusted according to previous reports^{1,2,3,4)}. Each of the three foods was prepared as follows.

- 1) The viscosity of the food product was measured without any modification (homogenize with a mixer) after 30seconds, 5minutes, 15minutes, and 30minutes.
- 2) The viscosity of the food product was measured with modification (homogenize with a mixer) after 30seconds, 5minutes, 15minutes, and 30minutes.
- 3) The viscosity was measured on the food product with modification (homogenize with a mixer) after adding 2 grams of thickener (A, B, C, and D) to the food (100g) after 30seconds, 5minutes, 15minutes, and 30minutes.

b) *Viscosity measurement method*

Using the Line Spread Test Start Kit (LST) manufactured by SARAYA, the viscosity of each food was measured. The measurement procedure is as follows. The line spread test (LST) was performed in a room with a room temperature of 24 degrees. Viscosity measurements by line spread test (LST) were performed three repetitions using the same sample. Data was obtained by averaging the viscosity results of three repeated measurements. The measurement method was according to Line Spread Test Start Kit (LST) manufactured by SARAYA.

1. Place the sheet on a level surface. Place a ring with an inner diameter of 30mm in the center of the concentric circles.

2. Add the liquid to be measured to the total thickness in the ring (capacity is 20ml) and let stand for 30 seconds.
3. Lift the ring vertically, and after 30 seconds, measure the spread distance of the solution. Six points on the outermost circumference of the sample spread concentrically were measured, and the average value was calculated as the result of LST values.
4. After 5 minutes, the spread of the samples is measured again at 6 points, and the average value is recorded as the LST value.

c) *Criteria for viscosity*

There are three levels of classification by LST value⁵⁾. The first stage is mildly thick with a viscosity that falls within 43mm to 36mm (50-150 mPa · s). As for the properties, when the spoon is tilted, it flows down quickly²⁾. The second stage is moderately thick with a viscosity that falls within 36mm to 32mm (150-300 mPa · s). As for the properties, when you tilt the spoon, it flows to the surface²⁾. The third stage is highly thick with a viscosity that falls within 32mm to 30mm (300-500 mPa · s). Even if the spoon is tilted, the shape is maintained to some extent, and does not flow easily⁵⁾.

d) *Statistical processing*

This study was statistically processed using statistical software (Excel 2010: SSRI Co., Ltd). The data to be compared were first tested for normal distribution by F-test. For comparisons between correlated data, the paired Student-t test was used for normally distributed data. Wilcoxon test was used for non-normally distributed data.

III. RESULTS

Table 3 shows the line spread test results. The viscosity of white rice porridge with salted plum decreased from moderately thick to mildly thick with time. When the white rice porridge with salty plum was processed with a mixer so that it became a uniform liquid, the viscosity became mildly thick. When

thickeners B and D were added to the liquid white rice porridge with salty plum, the viscosity remained highly dense. But, when thickener A and C were added to the liquid white rice porridge with salty plum, the viscosity decreased from highly dense to moderately dense with time.

Table 3. Viscosity measurement results of four types of thickeners for salted plum rice porridge using the line spread test

	After 30 seconds	After 5 minutes	After 15 minutes	After 30 minutes
No adjustment	35.6 ± 3.4	37.4 ± 3.7	37.6 ± 3.8	38.9 ± 3.7
Mixer processing (MP)	44.8 ± 3.0	48.6 ± 6.4	47.5 ± 4.7	47.3 ± 4.8
MP with Thickener A (Toromicria)	30.0 ± 3.5	31.3 ± 3.9	31.1 ± 3.8	31.4 ± 4.6
MP with Thickener B (Tururinko)	28.4 ± 1.7	29.7 ± 1.9	29.9 ± 1.9	30.2 ± 2.0
MP with Thickener C (Toromifaiver)	30.3 ± 2.8	30.9 ± 2.0	31.0 ± 1.9	32.8 ± 3.3
MP with Thickener D (Neohaitoromi-ru)	23.7 ± 3.4	24.1 ± 3.9	24.7 ± 4.0	25.3 ± 4.3

a) Statistical processing results

The line spread test results and statistical processing results are shown in Table 4-9. Except for the sample with Thickener A, C, and D, the viscosity was statistically significantly weakened from 30 seconds to 5

minutes after putting the white rice porridge with salty plum on the viscometer plate under other conditions. However, except for the sample with Thickener C, the viscosities of the white rice porridge with salted plum with thickener were highly dense.

Table 4. Line spread test (LST) measurement results of salted plum rice porridge

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ±Standard deviation	35.6±3.4	37.4±3.7	37.4±3.7	37.6±3.8	37.6±3.8	38.9±3.7
F test	P=0.370		P=0.465		P=0.456	
Paired Student t-test	P=0.0001**		P=0.083		P=0.127	
Wilcoxon test						

Table 5. Line spread test (LST) measurement results of salted plum rice porridge after mixer processing (MP)

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ±Standard deviation	44.8±3.0	48.6±6.4	48.6±6.4	47.5±4.7	47.5±4.7	47.2±4.8
F test	P=0.001**		P=0.104		P=0.460	
Paired Student t-test			P=0.283		P=0.331	
Wilcoxon test	P=0.0001**					

Table 6. Line spread test (LST) measurement results of salted plum rice porridge after mixer processing (MP) with Thickener A

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ±Standard deviation	30.0±3.5	31.3±3.5	31.3±3.5	31.1±3.8	31.1±3.8	31.4±4.6
F test	P=0.335		P=0.471		P=0.217	
Paired Student t-test	P=0.264		P=0.659		P=0.469	
Wilcoxon test						

Table 7. Line spread test (LST) measurement results of salted plum rice porridge after mixer processing (MP) with Thickener B

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ±Standard deviation	28.4±1.7	29.7±1.9	29.7±1.9	29.9±1.9	29.9±1.9	30.2±2.0
F test	P=0.364		P=0.455		P=0.447	
Paired Student t-test	P=0.0001**		P=0.104		P=0.020*	
Wilcoxon test						

Table 8. Line spread test (LST) measurement results of salted plum rice porridge after mixer processing (MP) with Thickener C

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ±Standard deviation	30.3±2.8	30.9±2.0	30.9±2.0	31.0±1.9	31.0±1.9	32.8±3.3
F test	P=0.075		P=0.477		P=0.015*	
Paired Student t-test	P=0.305		P=0.4505			
Wilcoxon test					P=0.070	

Table 9. Line spread test (LST) measurement results of salted plum rice porridge after mixer processing (MP) with Thickener D

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard dev	23.7 ± 3.4	24.1 ± 3.9	24.1 ± 3.9	24.7 ± 4.0	24.7 ± 4.0	25.3 ± 4.3
F test	P=0.276		P=0.468		P=0.381	
Paired Student t-test	P=0.088		P=0.066		P=0.243	
Wilcoxon test						

IV. DISCUSSIONS

By adding a commercial Thickener D (including dextrin, calcium lactate, and polysaccharide) to the white rice porridge with salty plum, the viscosity was the highest and was stable. Adding Thickener D (including dextrin, calcium lactate, and polysaccharide) to white rice porridge made it more viscous and stable⁶. Adding Thickener B (including dextrin, calcium lactate, xanthan gum, and tri-sodium chloride) and Thickener D made to white rice porridge with sticky barley (rich in fat) it more viscous and stable⁷. Adding Thickener B (including dextrin, calcium lactate, xanthan gum, and tri-sodium chloride) and Thickener D to white rice porridge with salmon (rich in protein) made it more viscous and stable⁸. As previously reported on the relationship between ease of swallowing and food viscosity^{9,10}, low viscosity also increases the likelihood of aspiration. In the case of porridge containing fat and protein, adding Thickener D (including dextrin, calcium lactate, and polysaccharide) stabilized the viscosity.

V. CONCLUSION

We liquefied white rice porridge with salty plums, popular in Japan, and added four commercially available thickeners to measure the viscosity. As a result, thickener D (including dextrin, calcium lactate, and polysaccharide) was the most viscous and stable when it was added to the porridge. For people with various swallowing functions, stockpiling a thickener that stabilizes the viscosity of the porridge to be stockpiled is necessary in case of a disaster.

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Line Spread Test Results for Commercially Available the White Rice Porridge with Egg - Including the Effect of Four Types of Thickening Agents Added After Blending -

By Mayumi Hirabayashi, Shoko Kondo & Naomi Katayama

Nagoya Women's University

Abstract- Viscosity was evaluated using a line spread test (LST) using white rice porridge with egg, which has more lipids and proteins than white rice porridge and has a wide range of versatility. Liquid porridge is used for older people with weak chewing, and babies as baby food have low viscosity, and are highly likely to be aspirated by people with weakened swallowing function. Therefore, a uniform liquid porridge was prepared using a mixer, and the viscosity was measured. As a result, it was shown that liquid porridge is thin and has a high risk of aspiration in people with weakened swallowing function. In order to increase the viscosity of the liquefied white rice porridge with egg, commercially available thickeners (four different types) were added. The viscosity of white rice porridge with egg with added thickener was evaluated using the line spread test (LST).

Keywords: commercial product, white rice porridge with egg, lin spread test (LST), thickener.

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Line Spread Test Results for Commercially Available the White Rice Porridge with Egg - Including the Effect of Four Types of Thickening Agents Added After Blending -

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Abstract- Viscosity was evaluated using a line spread test (LST) using white rice porridge with egg, which has more lipids and proteins than white rice porridge and has a wide range of versatility. Liquid porridge is used for older people with weak chewing, and babies as baby food have low viscosity, and are highly likely to be aspirated by people with weakened swallowing function. Therefore, a uniform liquid porridge was prepared using a mixer, and the viscosity was measured. As a result, it was shown that liquid porridge is thin and has a high risk of aspiration in people with weakened swallowing function. In order to increase the viscosity of the liquefied white rice porridge with egg, commercially available thickeners (four different types) were added. The viscosity of white rice porridge with egg with added thickener was evaluated using the line spread test (LST). As a result, the viscosity of the white rice porridge with egg to which the thickener containing dextrin, calcium lactate and thickening polysaccharide was added was stable. We need to investigate more combinations of porridges and thickeners that exhibit high density.

Keywords: commercial product, white rice porridge with egg, lin spread test (LST), thickener.

I. INTRODUCTION

There are many types of porridge on the market, some of which are highly nutritious. Among them, white rice porridge with egg containing a lot of

protein and Fat is more versatile than white rice porridge. It can be used as liquid porridge for baby food, older people with weak mastication, and sick patients. However, liquid porridge is highly likely to be aspirated by people with impaired swallowing function. Therefore, liquid porridges often require the addition of thickeners. Combining porridges of varying nutritional value and thickeners may not provide sufficient viscosity. In this study, we used a commercially available white rice porridge with egg, and four different Thickeners in chooses from many different kind of Thickeners. We evaluated the viscosity of the rice porridge after adding four types of thickeners using a line spread test (LST).

II. MATERIALS AND METHODS

The nutritional components of the white rice porridge with egg used in this experiment are shown in Table 1. The white rice porridge with egg used had 36.00 kcal, 1.32g of protein, 0.92g of Fat, 5.72g of carbohydrate, and 0.52g of sodium per 100g (displayed on the product packaging).

Table 1. Contents and nutritional value of commercial porridge

Contents		Nutrient contents (Per 100g)				
		Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Sodium (mg)
White rice porridge with egg	Egg, Non-glutinous rice, Bonito flakes extract, Salr, soy sauce, Yeast extract powder, Thickener (modified starch) 、 acidulant	36.00	1.32	0.92	5.72	0.52

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Table 2 shows the content and nutritional value of the four commercially available Thickeners. The main component of all thickeners was dextrin (displayed on the product packaging).

Table 2 Content and nutritional value of four types of thickeners

Contents		Nutrient contents (Per 2g)					
		Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)		Sodium (mg)
					Sugar (g)	Dietary fiber (g)	
A	Dextrin、Polysaccharide thickener、potassium chloride、sweetener (Sucralose)	5.27	0.00	0.00	0.87	0.47	10.67
B	Dextrin、Xanthan gum、Trisodium chloride、Calcium lactate	4.00	0.00	0.00	1.00	0.70	3.00
C	Dextrin、Water-soluble dietary fiber、Thickener (Xanthan gum)	5.40	0.00	0.00	1.36	0.50	12.33
D	Dextrin、Polysaccharide thickener、Calcium lactate	0.53	0.03	0.00	0.91	0.83	24.00

a) *Sample (food with Thickener added) adjustment*

Samples were adjusted according to previous reports^{1,2,3,4}. Each of the three foods was prepared as follows.

- 1) The viscosity of the food product was measured without any modification (homogenize with a mixer) after 30seconds, 5minutes, 15minutes, and 30minutes.
- 2) The viscosity of the food product was measured with modification (homogenize with a mixer) after 30seconds, 5minutes, 15minutes, and 30minutes.
- 3) The viscosity was measured on the food product with modification (homogenize with a mixer) after adding 2 grams of thickener (A, B, C, and D) to the food (100g) after 30seconds, 5minutes, 15minutes, and 30minutes.

b) *Viscosity measurement method*

Using the Line Spread Test Start Kit (LST) manufactured by SARAYA, the viscosity of each food was measured. The measurement procedure is as follows. The line spread test (LST) was performed in a room with a room temperature of 24 degrees. Viscosity measurements by line spread test (LST) were performed three repetitions using the same sample. Data was obtained by averaging the viscosity results of three repeated measurements. The measurement method was according to Line Spread Test Start Kit (LST) manufactured by SARAYA.

1. Place the sheet on a level surface. Place a ring with an inner diameter of 30mm in the center of the concentric circles.
2. Add the liquid to be measured to the total thickness in thering (capacity is 20ml) and let stand for 30 seconds.

3. Lift the ring vertically, and after 30 seconds, measure the spread distance of the solution. Six points on the outermost circumference of the sample spread concentrically were measured, and the average value was calculated as the result of LST values.
4. After 5 minutes, the spread of the samples is measured again at 6 points, and the average value is recorded as the LST value.

c) *Criteria for viscosity*

There are three levels of classification by LST value⁵. The first stage is mildly thick with a viscosity that falls within 43mm to 36mm (50-150 mPa · s). As for the properties, when the spoon is tilted, it flows down quickly². The second stage is moderately thick with a viscosity that falls within 36mm to 32mm (150-300 mPa · s). As for the properties, when you tilt the spoon, it flows to the surface². The third stage is highly thick with a viscosity that falls within 32mm to 30mm (300-500 mPa · s). Even if the spoon is tilted, the shape is maintained to some extent, and does not flow easily⁵.

d) *Statistical processing*

This study was statistically processed using statistical software (Excel 2010: SSRI Co., Ltd). The data to be compared were first tested for normal distribution by F-test. For comparisons between correlated data, the paired Student-t test was used for normally distributed data. Wilcoxon test was used for non-normally distributed data.

III. RESULTS

Table 3 shows the line spread test results. The viscosity of white rice porridge with egg decreased from moderately thick to mildly thick with time. The white rice porridge with egg was processed with a mixer to become a uniform viscosity became mildly dense. The

thickener B, C, and D were added to the liquid white rice porridge with egg, and the viscosity remained highly viscous. But, with the thickener A added to the liquid white rice porridge with egg, the viscosity decreased from highly dense to moderately dense with time.

Table 3. Viscosity measurement results of four types of thickeners for egg rice porridge using the line spread test

	After 30 seconds	After 5 minutes	After 15 minutes	After 30 minutes
No adjustment	37.0 ± 3.1	39.5 ± 2.1	40.3 ± 2.4	40.3 ± 2.1
Mixer processing (MP)	48.9 ± 5.6	54.8 ± 11.5	55.5 ± 12.7	54.5 ± 11.6
MP with Thickener A (Toromicria)	30.5 ± 2.8	32.4 ± 4.0	34.0 ± 3.0	34.3 ± 3.1
MP with Thickener B (Tururinko)	26.9 ± 2.3	28.4 ± 2.6	29.3 ± 2.8	29.7 ± 3.2
MP with Thickener C (Toromifaiver)	27.6 ± 3.6	29.1 ± 4.0	29.7 ± 3.9	29.9 ± 4.1
MP with Thickener D (Neohaitoromi-ru)	23.5 ± 5.3	24.5 ± 6.0	26.2 ± 5.7	24.6 ± 5.5

a) Statistical processing results

The line spread test results and statistical processing results are shown in Table 4-9. For all the samples, the viscosity was statistically significantly weakened from 30 seconds to 5 minutes, and from 5

minutes to 15 minutes after putting the white rice porridge with egg on the viscometer plate under other conditions. The viscosities of the white rice porridge with egg with thickeners B, C, and D were highly dense.

Table 4. Line spread test (LST) measurement results of egg rice porridge

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	37.0 ± 3.1	39.5 ± 2.1	39.5 ± 2.1	40.3 ± 2.4	40.3 ± 2.4	40.3 ± 2.1
F test		P=0.058		P=0.309		P=0.305
Paired Student t-test		p=0.0001**		p=0.0001**		p=0.668
Wilcoxon test						

Table 5. Line spread test (LST) measurement results of egg rice porridge after Mixer processing (MP)

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	48.9 ± 5.6	54.8 ± 11.5	54.8 ± 11.5	55.5 ± 12.7	55.5 ± 12.7	54.5 ± 11.6
F test		P=0.002**		P=0.349		P=0.454
Paired Student t-test		p=0.002**		p=0.579		p=0.306
Wilcoxon test						

Table 6. Line spread test (LST) measurement results of egg rice porridge after Mixer processing (MP) with Thickener A

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	30.5 ± 2.8	32.4 ± 4.0	32.4 ± 4.0	34.0 ± 3.0	34.0 ± 3.0	34.3 ± 3.1
F test		P=0.070		P=0.120		P=0.458
Paired Student t-test		p=0.004**		p=0.010**		p=0.780
Wilcoxon test						

Table 7. Line spread test (LST) measurement results of egg rice porridge after Mixer processing (MP) with Thickener B

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	26.9 ± 2.3	28.4 ± 2.6	28.4 ± 2.6	29.3 ± 2.8	29.3 ± 2.8	29.7 ± 3.2
F test		P=0.665		P=0.423		P=0.246
Paired Student t-test		p=0.0001**		p=0.0001**		p=0.250
Wilcoxon test						

Table 8. Line spread test (LST) measurement results of egg rice porridge after Mixer processing (MP) with Thickener C

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	27.6 ± 3.6	29.1 ± 4.0	29.1 ± 4.0	29.7 ± 3.9	29.7 ± 3.9	29.9 ± 4.3
F test		P=0.315		P=0.474		P=0.432
Paired Student t-test		p=0.0001**		p=0.0001**		p=0.381
Wilcoxon test						

Table 9. Line spread test (LST) measurement results of egg rice porridge after Mixer processing (MP) with Thickener D

	After 30 seconds	After 5 minutes	After 5 minutes	After 15 minutes	After 15 minutes	After 30 minutes
Average value ± Standard deviation	23.5 ± 5.3	24.5 ± 6.0	24.5 ± 6.0	26.2 ± 5.7	26.2 ± 5.7	24.5 ± 5.5
F test		P=0.306		P=0.412		P=0.440
Paired Student t-test		p=0.0001**		p=0.034*		p=0.095
Wilcoxon test						

IV. DISCUSSIONS

Using commercially available retort porridge, which is helpful in times of disaster, we tried to make a thick porridge that can avoid the risk of aspiration by people with dysphagia. In a paper published by the authors in the past, adding Thickener D (including dextrin, calcium lactate, and polysaccharide) to white rice porridge made it more viscous and stable⁶. In the white rice porridge with sticky barley (rich in fat), adding Thickener B (including dextrin, calcium lactate, xanthan gum, and tri-sodium chloride) and Thickener D made it more viscous and stable⁷. In white rice porridge with salmon (rich in protein), adding Thickener B (including dextrin, calcium lactate, xanthan gum, and tri-sodium chloride) and Thickener D made it more viscous and stable⁸. In the case of the white rice porridge with egg (rich in fat and protein), adding Thickener D (including dextrin, calcium lactate, and polysaccharide) made it more viscous and stable. As previously reported on the relationship between ease of swallowing and food viscosity^{9,10}, low viscosity also increases the likelihood of aspiration. Depending on the difference in the nutrients in the target food, it is considered that there is compatibility with other ingredients of the thickener containing dextrin. In order to think of a better combination, it is necessary to measure the viscosity of more combinations of thickeners and porridges.

V. CONCLUSION

A commercially available retort porridge, which is useful even in the event of a disaster, was used. A thickener added to avoid the risk of aspiration by people with impaired swallowing function. The viscosity of white rice porridge with eggs, which contains more protein and fat than white rice porridge, stabilized when Thickener D (including dextrin, calcium lactate, and polysaccharide) was added. The viscosity is also stabilized when Thickener B (including dextrin, calcium lactate, xanthan gum, and tri-sodium chloride) is added to the white rice porridge with eggs. When the thickener D was added to the white rice porridge with egg, the viscosity of the porridge stabilized more than when the thickener B was added. This difference in viscosity may be due to differences in the polysaccharide content of the thickening agent.

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Diagnosis and Treatment of Severely Malnourished Children in Outpatient Therapeutic Program

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Abstract- Severe acute malnutrition among children is still one of the main public health challenges in the 21st century, particularly in developing countries. It is associated with a high risk of morbidity and mortality. The goals of management of SAM are to prevent short-term mortality, achieve sustained nutritional recovery to reduce susceptibility to life-threatening infections, and support neurocognitive development. In addition to that, SAM children need urgent lifesaving treatment to survive. The outpatient therapeutic feeding program is one dimension of the community-based management of acute malnutrition that provides screening, diagnostic, and treatment services for uncomplicated SAM children 6–59 months of age, by giving home-based treatment as Ready-to-use Therapeutic Food and routine medical treatment. This review article gives a comprehensive update on outpatient therapeutic programmes in light of recently published standard treatment guidelines for the management of uncomplicated severe acute malnutrition.

Keywords: severe acute malnutrition, outpatient therapeutic program, malnourished children.

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INTRODUCTION

Severe acute malnutrition (SAM) among children is still one of the main public health challenges in the 21st century, particularly in developing countries (Bhutta & Salam, 2012). It is associated with a high risk of morbidity and mortality (Cashin & Oot, 2018). Children are the most vulnerable group to the effects of severe acute malnutrition during their most rapid physical growth and development, because of the additional nutritional requirements for growth and expansion at this time (Picot et al., 2012). It can manifest over a short period of time when the body does not receive adequate amounts of micronutrients or energy, either as a result of insufficient dietary intake or through malabsorption of nutrients or loss of appetite due to illness (James et al., 2015). It increases dramatically in emergencies and developing countries generally, where these settings are plagued by chronic poverty, poor hygiene, lack of education, poor diets and limited access to food (UNICEF, 2015c).

The goals of management of SAM are to prevent short-term mortality, achieve sustained nutritional recovery to reduce susceptibility life-threatening infections and to support neurocognitive development (Bhutta et al., 2017). In addition to that, SAM children need urgent lifesaving treatment to survive.

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The outpatient therapeutic feeding program is one dimension of the community-based management of acute malnutrition (CMAM) that provides screening, diagnostic and treatment services for uncomplicated SAM children 6–59 months of age, by giving home-based treatment as RUTF and routine medical treatment (Atnafe et al., 2019; UNICEF, 2015a). It brings the management of SAM closer to the community by making services available at decentralized treatment points within the primary health care (PHC) settings (John et al., 2018; WVI, 2017). RUTFs are highly fortified energy dense pastes designed to fulfill 100% of the nutritional needs of children during the recovery from SAM.

Child nutrition outcomes such as acute malnutrition in particular, is recognized as crucial indicator for tracking the nutrition and health status of children in a population (Fadare et al., 2019). The effectiveness of treatment of SAM has been proven through health interventions during emergency settings and routine development programs however there is high risk of program default and fatalities, if the interventions are not delivered adequately (Okello, 2016). The performance indicators for managing SAM of discharged children for SAM are made up of those who have cure $\geq 75\%$, defaulted $< 15\%$, non-respondent or died $< 10\%$, based on the Sphere minimum standards are used as a threshold for OTP performance (Sphere, 2018).

Definition of SAM: SAM in children 6–59 months of age is defined as a weight for height/length < -3 Z-score of the WHO growth standard, and, or MUAC of less than 115 mm, or the presence of bilateral pitting edema (nutritional edema) (UNICEF, 2015a; WFP, 2012; WHO, 2013a).

Pathophysiology of SAM: Acute malnutrition typically develops during the first two years of life, when growth velocity and brain development are exceptionally high. The children are particularly susceptible to acute malnutrition if complementary foods are low nutrient density and have low bioavailability of micronutrients. Also, children's nutritional status will be further compromised if complementary foods are given at the wrong time as too early or late, or are contaminated (WHO, 2013a). During short-term starvation, free fatty acids (FFAs) and ketone bodies are primarily oxidized using available fat stores from adipose tissue, and myofibrillar proteins can be broken down into amino

acids, which can be converted into glucose (through gluconeogenesis). After several days of starvation (when body fat has been depleted), myofibrillar proteins are extensively broken down to maintain essential metabolic processes. The short-term regulation of macronutrient oxidation and synthesis depends on insulin and glucagon, whereas the long-term regulation of these processes is mediated by other hormones, such as growth hormone, thyroid hormones, catechol amines and corticosteroids (Bhutta et al., 2017).

SAM can result in profound metabolic, physiological and anatomical changes. All organs and systems are involved in a “reductive adaptation” process due to nutrient shortage. Reductive adaptation is the physiological response of the body to low nutrition i.e., systems slowing down to survive on limited macro and micronutrient intake. The pathophysiological responses to nutrient depletion place children with SAM at increased risk of life threatening complications that lead to increased risk of death. Therefore, successful management of SAM requires both systematic medical therapy of underlying infections and nutritional treatment with therapeutic feeds (WFP, UNICEF, et al., 2017; WHO, 2013a).

Clinical picture of SAM

The common signs and symptoms of SAM include poor appetite, pallor, weight loss, increased thirst or vomiting and diarrhea plus behavior changes as well as excessive drooling (Kasio Iboyi & Zha, 2019). The clinical picture of SAM varies according to its two recognized forms such as marasmus and kwashiorkor (Mwangome et al., 2011):

Clinical signs of marasmus: Severe wasting is a massive loss of body fat and muscle tissue. Children who are severely wasted look almost elderly and their bodies are extremely thin and skeletal (AAH, 2022).

Clinical signs of kwashiorkor: In this form of severe acute malnutrition, edema is present on the lower limbs, and is verified when thumb pressure is applied on top of both feet for three seconds and leaves a pit or indentation in the foot, after the thumb is lifted. Edema may eventually spread to the legs and face, and the child appears puffy, and is usually irritable, weak, and lethargic. Other signs of edema include skin lesions, an enlarged liver and thinning hair. Underneath edema, the muscles have been severely weakened and the child experiences excruciating cramping and muscle pain (AAH, 2022).

Diagnosis of SAM in children

Globally, the most common method for screening and diagnosis of SAM among CU5 as individuals or populations can be done in different ways such as anthropometric measurements (nutritional index), clinical signs or nutritional edema (JMoH, 2013; WFP, 2012; WHO, 2009, 2013b).

Anthropometric measurements and indices

Anthropometry is a crucial tool measurement of the human body used by health providers. It is helpful in determining and monitoring the nutritional status, it identifies the type of malnutrition and measuring progress toward improvement among children. However, it does not identify specific nutrient deficiencies (e.g., iron or vitamin A). Common anthropometric measurements include: height/length, weight and MUAC (Cashin & Oot, 2018; WFP, FAO, et al., 2017). It is the preferred anthropometric indicator to assess acute malnutrition, where MUAC better than WHZ at identifying high risk children in the community (MoPHP et al., 2008; WFP, UNICEF, et al., 2017). Age, sex and bilateral pitting edema are essential parameters in anthropometry (WFP, FAO, et al., 2017).

Weight for Height Z-scores (WHZ): Anthropometric Z-scores describe how far and in what direction an individual's measurement is from the reference populations' median value. According to the WHO Growth Standards, the reference population is children the same sex and age. Z-scores that fall outside of the normal range indicate a nutritional issue (Cashin & Oot, 2018). WHZ is considered to be an essential measure of nutritional status and helpful in identifying SAM, it is appropriate threshold for diagnosing marasmus. It is calculated from patient's weight, height and sex, using WHO Growth Standards. It can be estimated using growth charts/tables and, or calculated using computer software (Cashin & Oot, 2018; JMoH, 2013; Picot et al., 2012; WFP, 2012; WHO, 2009, 2013b, 2020).

Mid Upper Arm Circumference (MUAC): Measurement of MUAC provides a reliable and simple tool for screening nutritional status and also enables rapid assessment of large populations in epidemiological field studies. (Shinsugi et al., 2020). WHO and UNICEF recommended using the MUAC as an independent indicator of SAM. It is a helpful measure within community or during emergency situations, when measuring children's height and weight may prove difficult. MUAC is also used for diagnosis, admission and discharges of children with SAM, particularly in CMAM programs, because it is a simple and inexpensive measurement and does not require a chart to calculate. It is measured by a band around the mid-point of the upper left arm of the child (Cashin & Oot, 2018; JMoH, 2013; Picot et al., 2012; WFP, 2012; WHO, 2009, 2013b, 2020). Study conducted in India by Aguayo et al. (2015), concluded that MUAC appears to be an appropriate criterion for identifying SAM children.

Clinical signs of bilateral edema

Bilateral pitting edema is a clinical sign of a specific form of SAM known as nutritional edema (edematous malnutrition or kwashiorkor). It is a swelling caused by the accumulation of fluid in the body tissues and can be categorized as mild (edema in both

feet/ankles), moderate (edema in feet plus lower legs, hands or lower arms) and severe (generalized edema including feet, legs, hands, arms and face)(WHO, 2020):

Outpatient treatment of SAM

The outpatient treatment of SAM programs aims for more widespread access to treatment primarily by establishing the appropriate facilities and activities within more communities (UNICEF, 2012). The rapid expansion of community based treatment programs worldwide, lead to every year millions of children being treated for SAM (Briend & Berkley, 2016). Typically, children treated in the community with uncomplicated SAM have a CFR less than 5%(Williams & Berkley, 2018). Uncomplicated severely malnourished children should be managed as outpatients, by providing them with weekly of RUTF, which can often follow at home if the child has clinically well, alert and retained appetite.(Jones & Berkley, 2014; Lenters et al., 2016; WHO, 2019; Williams & Berkley, 2018).

SAM treatment program depends on the four following principles; maximum coverage and access, timeliness, appropriate care and care for as long as it is needed (Lenters et al., 2016). Therefore the program strives to reach all severely malnourished children before the development of medical complications and to provide appropriate care until recovery. The program uses community health workers or volunteers to actively find cases of acute malnutrition within the community. The severely malnourished children treated should be supplemented with routine medications during the treatment course such as vitamin A, folic acid, antibiotics, deworming and measles vaccine(Al Amad et al., 2017).

Children with SAM should be treated proactively with intensive treatment regimens of short duration, aiming to rehabilitate the child in a few weeks. OTP is currently used to achieve rapid recovery from SAM, it provides services of SAM management closer to the community at primary health care facilities, where uncomplicated SAM children receive different amounts of RUTF as Plumpy'Nut sachets according to their body weight(Al Amad et al., 2017; WFP, UNICEF, et al., 2017).The caregivers visits the health facility or OTP point every week or two weeks with their child for a medical checkup and to receive a weekly supply of RUTF. OTP should be operated in as many health facilities as possible and should be incorporated into existing health services as a component of routine services for CU5, this ensures good geographic coverage so that as many malnourished children as possible can access treatment(WFP, UNICEF, et al., 2017).

Admission criteria in OTP: According to the national guidelines for management of SAM based on WHO, UNICEF and WFP recommendations, admission criteria in OTP are determined by a child's weight and height,

by calculating weight-for-height as "Z-score" using the WHO Child Growth Standard, MUAC and presence of edema. Cutoffs are summarized as the following (UNICEF, 2012, 2015b; WFP, UNICEF, et al., 2017; WHO, 2013a, 2020):

- ✓ Bilateral pitting edema 1st (+) or 2nd (++) degree, or
- ✓ MUAC < 115 mm, and/or
- ✓ Weight-for Height/Length < -3 z-score, and
- ✓ Good appetite (passed appetite test for RUTF), and
- ✓ Clinically well and alert (no medical complications).

Routine medications and prevention package used in OTP

All SAM programs should include systematic treatments according to national or international guidance (Sphere, 2018). Children admitted directly to OTP should receive a short and routine course of essential oral medication such as antibiotic (Amoxicillin), anti worms (as Albendazole or Mebendazole), anti malaria, vit A, folic acid and measles vaccination, and some prevention package as soap and bed net. It reduced the risk of severe bacterial infection and improves the recovery rate (MoPHP, 2014; Pati et al., 2018; WFP, UNICEF, et al., 2017; WHO, 2013a). The use of broad-spectrum antibiotics has been conditionally recommended for treatment of uncomplicated SAM. (Black et al., 2016). A systematic review conducted by Williams and Berkley (2018), concluded the current evidence supports the continued use of broad spectrum oral amoxicillin for treating children with uncomplicated SAM.

Nutritional treatment by RUTF: The development specially formulated RUTF has enabled treatment of SAM in the community and made a difference in child survival. It provides 100% of the energy needed from foods(Osendarp et al., 2015). RUTF has become a standard method of treating SAM and is easier to use and distribute during nutritional emergencies. It is a very effective therapeutic food in the rehabilitation children with SAM in many settings (Bazzano et al., 2017; UNICEF, 2012).

Plumpy-Nut® is one of the most of RUTF used in the world, it is a commercial product of Nutriset (UNICEF, 2012). An average entire course of treatment for a child amounts to around 10-15 kilograms of RUTF over a 6-8 week period(Force, 2012; UNICEF, 2013). If the mother is still breastfeeding, she is advised to give the RUTF after breast milk, explain that clean water must be given to a child eating RUTF to keep them adequately hydrated and should be given RUTF before other foods. It should not be given to children who are allergic to peanuts or dairy products. About central nutritional values describe in the table (2.1)(NUTRISET, 2018). Each sachet of Plumpy'Nut® of 92g provides 500kcal. A child undergoing treatment for SAM should take in approximately 200kcal/kg/day. Provide a weekly

supply of Plumpy'Nut® sachets based on the child's body weight (NUTRISET, 2018; WFP, UNICEF, et al., 2017). Some contexts, families receive additional rations

to prevent household sharing of the child's RUTF ration (WVI, 2017).

Main nutritional values (NUTRISET, 2018)

Plumpy'Nut® formula: elements for 92 g					
Energy	500 kcal	Copper	1.5 mg	Vitamin B1	0.46 mg
Proteins	12.8 g	Iron	10.3 mg	Vitamin B2	1.5 mg
Lipids	30.3 g	Iodine	98 µg	Vitamin B6	0.55 mg
Carbohydrates	45 g	Selenium	28 µg	Vitamin B12	1.5 µg
Calcium	302 mg	Sodium	165 mg	Vitamin K	14.4 µg
Phosphorus	343 mg	Vitamin A	0.79 mg	Biotin	56 µg
Potassium	1 171 mg	Vitamin D	14 µg	Folic acid	184 µg
Magnesium	80 mg	Vitamin E	18.4 mg	Pantothenic acid	2.8 mg
Zinc	11.8 mg	Vitamin C	46 mg	Niacin	4.6 mg

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Risk Factors for Chronic Malnutrition in Children Aged 6 to 23 Months in Bopa, Southwest Benin

By Guy Armand Onambélé, Laïfoya Moïse Lawin, Arouna Lokoyo, Moïse Djralah, Jeanne Madindé, Achille Ayalé, Odette Alihonou, Anani Agossou, Eunice Amoussou, Cory Sinsin & Ephiphane Ladélé

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Abstract- During the first two years of a child's life, nutritional status is crucial for his or her well-being and growth. This study explains the risk factors of chronic malnutrition during the first two years of life in south west Benin. The methodological approach uses the construction of Food Consumption Score (FCS), Reduced Coping Strategies Index (rCSI), Household Dietary Diversity Score (HDDS), and Livelihood Coping Strategies (LCS). The Chi2 test helps to examine the dependency between the variables. The simple binary logit model is used to explore the effects of the explanatory variables on the dependent variable. The results show that about 27% of children aged 6-23 months are chronically malnourished. The age range of the child, the type of union, the average monthly income of the head of the household, the food consumption score, and the size of the family determine the chronic malnutrition. During difficult times, households rely on atypical coping strategy mechanisms by disposing of their productive assets. 20.3% of households can marginally cover their minimum food needs using crisis or emergency coping strategy mechanisms.

Keywords: Stunting, Benin, Nutrition, Diet, Risk factors.

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1. INTRODUCTION

The problem of malnutrition derives from the effects of the choices made by a family unit to meet its food needs. Far from being the result of the application of a norm, food is the result of the assimilation by individuals of the modes of accommodation decreed by the culture to which they belong. For WHO (2000), malnutrition is characterized by inadequate or excessive intake of protein, energy, and micronutrients such as vitamins and minerals, as well as by the frequent infections, and health disorders that result. Latham (2001) restricted the term malnutrition to undernourishment or inadequate intake of energy, protein, and micronutrients required to meet the basic needs of the body for maintenance, growth, and development. There are several forms of malnutrition: global acute malnutrition, severe acute malnutrition, and chronic malnutrition (Park and al., 2012). According

to these authors, the forms of malnutrition have different causes. Acute malnutrition results from acute food deprivation and is defined by a decrease of two standard deviations below the weight-for-height index. Severe acute malnutrition results from the onset of diarrhea, respiratory infection, and malaria. It's defined as a decrease of two standard deviations below the weight-for-height index. In contrast, chronic malnutrition, also known as stunting, is a decrease of two standard deviations from the height-for-age index. Several authors have mapped out the different forms of malnutrition, showing the need to address this issue.

The United Nations Children's Fund, the World Health Organisation, and the World Bank estimated in 2015 that about 159 million children under five were affected by chronic malnutrition worldwide, or 23.8% (UNICEF, WHO, World Bank, 2015) (Amadou et al., 2020). Its importance varies by region. Research results from Ekholuenetale and al. (2020) show that sub-Saharan African countries present disparities on several malnutrition indicators, including stunting, underweight, overweight, anemia, and child survival. West and Central Africa are the most affected by child malnutrition (Amadou and al., 2020; Pomati et al., 2020), with a rate of 35% (Amadou and al., 2020).

Among the consequences of malnutrition, it exposes children to greater susceptibility to infections and an increased mortality risk. Park and al. (2012) found that acute malnutrition accounts for over 50% of infant mortality in children under five. Similarly, Black and al. (2013) estimate that 45% of child deaths per year can be directly attributed to malnutrition or have an underlying cause of malnutrition. Such a high rate of malnutrition in Central and West African countries (35%, according to Amadou and al., 2020) is leading governments and international organizations to look more closely at the risk factors for malnutrition in these areas. As a result, the specific case of Benin is being considered. The apprehension of malnutrition on a global scale resorts most of the time to regional descriptive analyses. Very few studies have focused on the specific risk factors in each country to identify the most effective approaches to solve this issue. Moreover, few econometric studies have focused on the risk factors of chronic malnutrition in West or Central Africa. To fill this gap, this study would like to determine the risk

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factors of chronic malnutrition in children aged 6-23 months in south west Benin.

The scientific literature on chronic malnutrition in children is quite diverse. Both, biomedical and social sciences focused on this topic. Looking at the determinants of malnutrition in children, Deutz and al. (2019); Fleurke and al. (2020) linked it to the child's and household's environment, the head of household and spouse characteristics and daily diets of the child. For Groleau and al. (2014), nutritional indices (weight, height, body mass index) determine the presence or absence of malnutrition in a child. In children, chronic malnutrition is related to deficiencies in the household diet. These deficiencies are due to the limited availability and accessibility of food associated with constraints on access to land and agricultural inputs, limited family production due to poor quality land, and its remoteness from villages (Dubot, 2005). Despite food availability, if food prices are too high, poor households cannot access it because of their low purchasing power (Dubot, 2005).

The availability of health and socio-economic infrastructure, the availability and diversity of food products on the market, and the diversity of livelihoods, and food consumption are more visible in cities where few children are at risk of malnutrition. In rural areas, where precarious lifestyles and activities predominate, children are more frequently emaciated than those living in urban areas. Global food and nutrition security analyses (2009, 2013, 2018, 2022) show that in Benin, rural areas are more affected by chronic malnutrition than urban areas. Other studies have associated the father's occupation with chronic malnutrition in children under five. This is the case with the work done by Islam and al. (2013). Also, Srivastava (2014) showed that children with a farmer's father are at higher risk of stunting. There is also a differential in child growth depending on the gender of the household head. Indeed, when the woman is the head of the household, children are less likely to be stunted than when the man is the head. When women have more decision-making power, especially over children's health and diet, this can benefit to their children (WFP, 2018).

Some analyses have focused on the relationship between chronic malnutrition and household size. According to these authors, chronic malnutrition arises from the difficulties of households in securing their food intake. Although levels of chronic malnutrition are lower in smaller families, several other studies did not get different findings (Wong and al., 2014). Also, it should be noted that the presence of more than two children under five in a household is negatively correlated with the child's nutritional status (Bosch, 2007). The nutritional status of children is affected in a household hosting more children under five to feed with a reduced income.

For Srivastava (2014), children from households with low diversity and food consumption scores are at much higher risk of chronic malnutrition. The parent's education level is also a driving factor in chronic malnutrition, according to other actors. Educated parents are more likely to provide their children with better health and nutritional conditions for their growth and development.

One line of thought has shown that culture plays a significant role in food costumes. It determines the eating habits and preferences as well as food is stored in a community. Socio-cultural factors may contribute to nutritional deficiencies and impacting nutrition status (Latham, 2001). Beliefs, values, and dogmas linked to religious practices influence perceptions and partly determine the habits and behavior of the faithful. This influence is due to the prohibition by religions of consuming certain foods. For example, Muslims and adepts of Celestial Christianity do not eat pork and Hindus do not eat beef, which is revered, even though these foods are very rich in proteins and iron, which are essential for the body.

The nutritional status of the mother can determine that of her child. The body mass index, which provides information on the nutritional status of the mother/child, is associated with chronic malnutrition in children under five. Thus, children whose mothers suffer from chronic energy deficiency are more likely to be affected by chronic malnutrition (Masibo and al., 2012). The negative influence of women's activity on nutrition is raised by some authors. Working women are often challenged by the constraints of equitable management of working time and time to take care of children. According to Akoto and Hill (1988), the mother's activity may force her to reduce the duration of breastfeeding and practice early weaning, while favoring the occurrence of chronic malnutrition in the child (Akoto and Hill, 1988). However, the economic activity of the mother can positively influence the nutritional status of children. By improving the household's standard of living and the availability of household resources, women's employment can improve the quality of care for the child, particularly in terms of nutrition and health.

It should also be noted that the vulnerability of girls and boys to disease and death is different. Indeed, studies have shown that male children are much more likely to suffer from chronic malnutrition (Masibo and al., 2012). In contrast, Thurstans and al. (2020) showed that girls are at greater risk of undernutrition. In a study of children in the Philippines in 1988, Horton pointed out that age, sex, and birth order of children had significant impacts on their nutritional status. Handa (2020), using linear regression in which the dependent variable is the height-for-age z-score, showed that women's educational attainment has a positive impact on the health of children in Jamaica. The present study intends to fill the knowledge gaps suggested by this literature

review with a methodological approach consistent with the subject matter.

II. DATA AND METHODS

This study is based on data collected in December 2020 in south west Benin in 40 villages in the commune of Bopa. The sample covered is 558 households selected from a two-stage random sample. The heads of households provided socio-economic data. Anthropometric measurements were taken on 189 children aged 6-23 months. Food consumption and livelihood indicators were calculated (see Annex) using their standard methodology. Stunting was analyzed using the WHO Z-Score methodology (2005). Chi-square tests were performed to analyze the dependence or influence of explanatory factors on malnutrition. A simple binary Logit regression model is used to measure the effects of the explanatory variables on the explained variable. The presence or absence of malnutrition in a child is the dependent variable. Average monthly income, marital status, age, mother's

education, household size, child's birth rank, dietary diversity score, food consumption score, reduced coping index, and livelihood strategies are the explanatory variables. In the simple binary logit model, the dependent variable noted Y takes two possible forms: 0 if the child is stunted and 1 otherwise.

$P(Y = 1)$ respectively $P(Y = 0)$ is the a priori probability that $Y = 1$ (respectively $Y = 0$). Let's say: $P(Y = 1) = F(X\beta)$ et $P(Y = 0) = 1 - F(X\beta)$ where F is a distribution function R on the interval $]0,1[$, increasing in its argument and β a vector of parameters (to be estimated) associated with the vector X and of dimension $(L, 1)$ if the vector X is of dimension $(1, L)$.

The logit model is the one defined by:

$$P(Y = 1) = \frac{\exp(X\beta)}{1 + \exp(X\beta)} \text{ and } P(Y = 0) = \frac{1}{1 + \exp(X\beta)} \quad (1)$$

The Logit model is defined by the following equation:

$$(Y) = \alpha_0 + \alpha_1 * \text{taille} + \alpha_2 * \text{AgeEnfant} + \alpha_3 * \text{statumatrimeo} + \alpha_4 * \text{SDAM} + \alpha_5 * \text{NEM5} + \alpha_6 * \text{Instrumère} + \alpha_7 * \text{Statégie} + \alpha_8 * \text{rang} + \alpha_9 * \text{Rcsi} + \alpha_{10} * \text{Revenuménage} + \mu_i$$

Where α_0 is the constant term; α_i , the regression coefficients, μ_i , the error term and:

Y_i is the dependent variable (Malnutrition status); Size: Size of the household; AgeChild: Age category of the child; Statumatrimeo: Type of union; SDAM: Household dietary diversity score; Instrumère: Mother's level of education; Rank: Child's birth rank; Rcsi: Reduced coping strategies index; Household income: Average monthly income of the household; NEM5: Number of children under 5 years old in the household.

III. RESULTS

According to the findings, 21.16% of households can cover between 50% to 75% of their needs, while the majority of households (70.9%) cover less than 50% of their needs. The household diet reveals poor (26.98%), borderline (32.28%) and acceptable (40.74%) food consumption scores. Less than 6 out of 12 recommended daily food groups are consumed by 51.1% of households. Milk, dairy products, meat, eggs, and fruits, which are rich in micronutrients, are the least consumed. On the other hand, cereals (wheat, maize, rice, sorghum, millet), vegetables, oils, and fats are the most consumed foods. When households have a challenging time accessing food, they use reduced coping strategies. The reduced coping strategies index calculated is less than or equal to 4 for 58.73% of households and between 4 to 18 for 41.27% of households. Concerning livelihood strategies, 31.22% of

households adopt stress strategies, and 21.69% adopt crisis and emergency strategies. The results show that about 27% of children aged 6-23 months are stunted.

a) Bivariate Analysis

The findings show that the age category of the child has a significant influence (Appendix table) on their nutritional status. Children aged 6 to 12 months are relatively less affected by chronic malnutrition than children aged 12 to 23. Indeed, 17.9% of the children aged 6 to 12 months in the sample are stunted, whereas the rate is 32% for children aged 12 to 23. Furthermore, household's significantly influences the nutritional status of the child. In addition, the nutritional status of the child depends greatly (Pearson Chi2 = 4.87 Prob = 0.0273) on whether or not there is another child under the age of 5 in the household. It should be noted that the Chi2 test confirms a statistically significant relationship between household income level and the presence or absence of malnutrition in the child. A logistic regression model is used to assess the powerful effects of the explanatory variables on the explained variables.

b) Multivariate Analysis

The results of the estimated correlation are presented in table No1 below.

Table 1: Logistic Regression Results

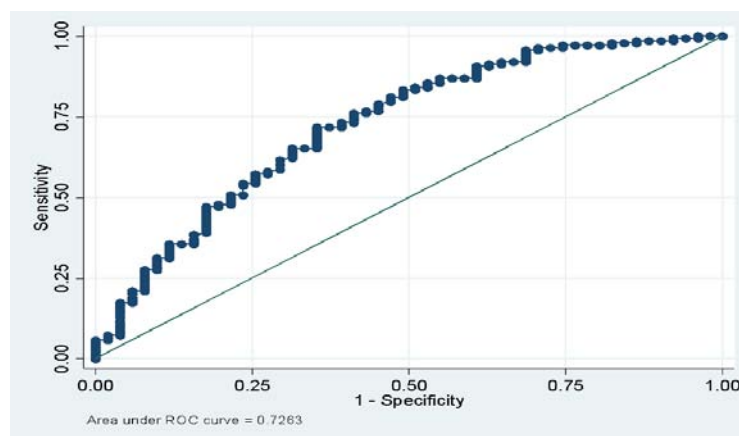
Malnut status	Coef.	St.Err.	t-value	p-value	Sig
size	0.535	0.248	-1.35	0.178	
AgeChild	0.399	0.163	-2.25	0.024	**
Statumatriimo	2.827	1.227	2.39	0.017	**
NME5	0.745	0.386	-0.57	0.57	
Revenuménage	0.742	0.132	-1.67	0.094	*
instrucmere	1.289	0.355	0.92	0.357	
rank	1.099	0.131	0.79	0.43	
SCA	1.644	0.395	2.07	0.039	**
Rcsi	1.407	0.551	0.87	0.384	
Strategy	.965	.2	-0.17	0.862	
SDAM	1.145	0.478	0.32	0.746	
Constant	3.959	4.953	1.10	0.271	
*** p<.01, ** p<.05, * p<.1					

Source: AARG (2020) NutAumed data set

The econometric results show that the child's age, the marital status of the head of household, the income of the head of household and the household food consumption score significantly determine the presence or absence of chronic malnutrition in children aged 6 to 23 months. Children from 6 to 12 months are 0.399 times less likely to be chronically malnourished than those between 12 to 23. Similarly, children living in a family where the head of the household is a widow or widower are 2.827 times more likely to be chronically malnourished. On the other hand, high-income households are less likely to have chronically

undernourished children in their households. In addition, children in families with low dietary diversity scores are 1.644 times more likely to be chronically malnourished than those with high dietary diversity scores. To assess the quality of the predictive power of the model, the GINI curve measures the specification of the model.

The analysis of the graph shows that the LROC curve is above the first bisector, which shows that the predictive power of the model is high. Thus, the model is overall good. The results showed that the explanatory power of the model used to identify the main risk factors for malnutrition is 72.78%.



Source: AARG (2020), Representation of the authors

Figure 1: Model Predictive Quality Evaluation Curve

IV. DISCUSSION

The analyses show that about 27% of children are chronically malnourished in Bopa. The rate of chronic malnutrition in south west Benin is above the global level (23.8%) and below the average for West and Central Africa (35%) (Amadou et al., 2020), which reflects the fact that malnutrition is still high among children in some African countries including Benin.

Empirical works by Borel (2007); Mukalay and al. (2010); Guy and al. (2020) revealed that the age category of the child determines the presence of chronic malnutrition in children. The same is true of the work of Padonou (2014), Diop and al. (2020), Ategbo and al. (2013), Kouakou and al. (2017), Kaid and al. (2022). Borel (2007) justifies the link between a child's age category and nutritional status. The more child's age evolves, the more his body needs more nutrients. Therefore, if the nutritional intake is not aligned with his or

her body's needs, he or she runs the risk of suffering from chronic malnutrition. For Kaid and al. (2022), the older the child is, the less likely he or she is to have poor nutritional status, until the second or third year, when the trend is reversed. For these authors, during the first two years, infants tend to have problems of undernutrition that dissipate as they grow older (Kaid and al., 2022). But from the third year onwards, this trend is reversed, and the risk of malnutrition increases. They explain this result by the fact that with age, the dietary needs of children change and increase. However, for Kouakou and al. (2017), Traoré and al. (2008), children's risk of malnutrition first increases at 12-23 months, and decreases after this period.

The head of the household characteristics notably, marital status and type of union are significantly associated with the nutritional status of the children. The statistics show that out of 42 children aged between 6 to 23 months surveyed in polygamous families, 19 (meaning 45.23%) were chronically malnourished compared to 23.02% of children from monogamous households. This result is similar to the work of Savadogo (2022). He explained its findings by the probability of minimal meal frequency is 2.3 times higher among children of polygamous mothers. In other words, monogamous mothers are 2.3 times more likely to practice adequate minimum dietary diversity than polygamous mothers.

Household size is one of the explanatory factors for child malnutrition. For Kaid and al. (2022), belonging to a large family increases the probability of stunting in children. For the authors, the distribution of household resources over many people reduces expenditure on food and health care for children. This can harm their health and is especially apparent over time. Thus, children living in large families have an unfavorable standard of living and hence a higher probability of having a poor nutritional status over a long period. Guy and al. (2020), Wong and al. (2014), and Savadogo (2022) also found that malnutrition is related to household size. Guy and al. (2020) justify this link as a consequence of food insecurity induced by high household size. For these authors, the risk of food insecurity is greater for households with large sizes. This exposes children to undernourishment and results in malnutrition in these very vulnerable individuals. For Savadogo (2022), high household size is a significant factor in minimal dietary diversity among children.

The level of household income is also a determining factor of child malnutrition. Kaid and al. (2022) found that children whose household heads are economically active or retired are less likely to be stunted. This is because low-income households cannot guarantee a healthy, balanced diet and a standard of living conducive to children's health. Guy and al. (2020) justify the association between malnutrition and household income in terms of food availability and the

health environment. As income increases, so does the ability to afford the foods needed for a diet (Mutisya and al. 2015).

An association is established between Food Consumption Score and Malnutrition. A low Food Consumption Score results from inadequate feeding and poor dietary diversification (Guy and al. (2020). For Mongbo and al. (2022), the association between malnutrition and food insecurity seems clear since the quantity and quality of food depend on food security.

The results of this study establish a link between malnutrition and the presence of other children under 5 years of age in the household. The work of Ernest and al. (2016), and Savadogo (2022) illustrates this result perfectly. The findings of Ernest and al. (2016) show that chronic malnutrition is related to the number of children under five in the household.

V. CONCLUSION AND RECOMMANDATION

This study is aiming to analyse the risk factors of chronic malnutrition in children aged 6 to 23 months in south west Benin.

According to socio-economic analysis, 76.37% of households live in rural areas. About 90% earn monthly less than 70.000 CFA francs. In Addition, 70% of households cover less than 50% of their needs. Concerning Food Consumption Score (FCS), 26.98% of households have a poor FCS, 32.28% have a borderline FCS, and less than 40.74% have an acceptable food consumption score. Regarding dietary diversity, 88.5% of households consume primarily cereal-based foods. This poses a challenge to a balanced diet and calls for nutrition education. The results on nutrition show that about 27% of children are chronically malnourished. To meet their food and nutritional needs, households do not hesitate to use atypical coping strategies mechanism to survive.

Statistics show that to face daily challenges, 31.22% of households practice stress strategies, and about 21.7% practice crisis or emergency strategies. It should be noted that 13.7% of families are not able to afford some essential non-food items without engaging in coping strategies with irreversible consequences. It is noted that 20.3% of households are marginally able to meet their minimum food needs by depleting livelihood assets or by employing crisis or emergency coping strategies and liquidating their assets. The results of the Chi 2 tests show a dependency between chronic malnutrition and household size, the age category of the child, type of union of the head of household, and average monthly household income. The econometric analyses reveal that the main risk factors for malnutrition in the area under consideration are household size, the age category of the child, type of union, average monthly household income, and household food consumption score.

The results of this study lead to the recommendation that the government develops education on birth control for households, especially in rural areas. This will make it possible to control the size of families. Secondly, a strengthening of nutritional education for women and nannies, in particular, will make it possible to reinforce their knowledge of dietary diversity for children.

Conflict of Interest Statement

The authors state that there is no conflict of interest.

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Data Availability Statement

The data used in this paper is fully available and can be accessed upon request.

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APPENDIX

Annex 1: Calculation of the Food Consumption Score

The SCA is a composite score based on dietary diversity. This index takes into account the frequency of meals and the relative nutritional importance of the

different food groups consumed by a household. The foods considered are grouped into 8 standard groups: (1) Cereals and tubers; (2) Pulses; (3) Vegetables; (4) Fruit; (5) Meat and fish; (6) Milk; (7) Sugar; (8) Oil. In the construction of the index, the consumption frequency (0 to 7) of each food group is multiplied by a specific weighting coefficient. The values obtained (frequency * nutritional value) are added together to determine the food consumption score (FCS) in a range from 0 to 112 for each household. $FCS = (starch \times 2) + (pulses \times 3) + vegetables + fruits + (meat \times 4) + (dairy \times 4) + (fat \times 0.5) + (sugar \times 0.5)$. This index has been validated by IFPRI as a proxy indicator of energy sufficiency. When a household has a score between 0 and 21, it is considered to have poor food consumption. A score between 21.5 and 35 is interpreted as borderline food consumption. Above 35, food consumption is considered acceptable.

Annex 2: Calculation of the household dietary diversity score (HDS)

The SDAM focuses on dietary diversity. This index is based on a group of 12 foods. For a given household, it is asked whether the food groups were consumed in the last 24 hours. Household responses are recorded as follows for each of the 12 food groups: "Yes" = (1) and "No" = (0). The responses are then summed to obtain the number of food groups consumed (between 0 and 12) in the last 24 hours.

Annex 3: Calculation of the reduced index of coping strategies related to food access IrSA

The IrSA or rCSI ("reduced Coping Strategy Index") was developed by the World Food Programme (WFP). This indicator focuses on food management. It provides trend information on household food security. It asks what strategies households use when they are faced with a lack of food or money to buy food. Thus, each household is assigned an rCSI score by multiplying the

frequency of relevant coping strategies by a severity coefficient and then summing the results as follows: $rCSI = \text{alts less valued} + (\text{borrowing} \times 2) + \text{decreasing port}^\circ + (\text{restr}^\circ \times 3) + \text{red}^\circ \text{ nb meals}$.

Annex 4: Constructing livelihoods-based coping strategies (LBS)

The strategies can be divided into stress strategies, crisis strategies and emergency strategies. For the livelihoods management module, countries/organizations should select a total of 10 strategies: 4 stress, 3 crisis and 3 emergency strategies. The master list of strategies developed by WFP suggests severity categories for all included strategies.

Appendix 5: Calculation of stunting

The indices addressed in this research include height/length for age, weight for height/length, weight for age. The assignment of anthropometric z-scores is based on the WHO child growth standards. It is done through a function that takes into account age (measured by the difference between the date of birth and the date of the interview, both specified to the day of the month), height in centimetres and weight in kilograms (Perumal et al., 2020; Corsi et al., 2017; USAID. 2016).

This study assesses stunting, wasting and underweight in children. The calculation of stunting is based on the child's height and age. It measures chronic nutritional deficiency. Wasting is based on the child's weight and height and measures acute nutritional deficiency. While underweight, based on weight and age, is a composite measure of acute and chronic malnutrition (Perumal et al., 2020; Corsi et al., 2017; USAID. 2016). For wasting, the weight-for-height z-score is less than minus 2 (-2.0) standard deviations above the mean of the WHO child growth standards.

The Table Shows the Results of the Chi2 Test

Malnutrition by Household Size			
Household size	Presence of chronic malnutrition	Absence of chronic malnutrition	Total
Less than 5 people	15	67	82
5 persons and more	36	71	107
Total	51	138	189
Pearson Chi2 = 5.55 Prob = 0.0184			
Malnutrition by Age Category of Child			
Age category	Presence of chronic malnutrition	Absence of chronic malnutrition	Total

[6 months to 12 months	12	55	67
[1 to 2 years[39	83	122
Total	51	138	189
	Pearson Chi2 = 4.34 Prob = 0.0373		
Malnutrition According to the Presence or Not of Another Child Under 5 In The Household			
	Presence of chronic malnutrition	Absence of chronic malnutrition	Total
No other child under 5 in the household	39	123	162
Presence of another child under 5 in the household	12	15	27
	Pearson Chi2 = 4.87 Prob = 0.0273		
Malnutrition by Type of Union			
Type of union	Presence of chronic malnutrition	Absence of chronic malnutrition	Total
Polygamy	19	23	42
monogamy	32	107	139
Widowed or divorced	0	8	8
Total	51	138	189
	Pearson Chi2 = 11.17 Prob = 0.0038		
Malnutrition by Average Household Income			
Rate of coverage of household needs	Presence of chronic malnutrition	Absence of chronic malnutrition	Total
Less than 40,000	31	90	121
[40000 ; 70000[8	41	49
[100000 ; 250000[9	3	12
More than 250,000 F	1	1	2
DK	2	3	5
Total	51	138	189
	Pearson Chi2 = 7.88 Prob = 0.0485		



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Addressing Comorbid Anxiety in Family-Based Treatment for Adolescent Anorexia Nervosa: User Experiences and Perspectives

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Abstract- Purpose: This study examines three families' experiences of the influence of comorbid anxiety on the effectiveness of family-based treatment (FBT) for anorexia nervosa (AN) and the effect of an add-in module addressing comorbid anxiety, and how this might interact with the families' work on AN and the young person's (YP's) sense of self-efficacy.

Method: Qualitative interviews were carried out with three families, who had been offered an add-in module at The Child and Adolescent Mental Health Centre of the Capital Region of Denmark. All interviews were analysed using thematic analysis.

Keywords: *anorexia nervosa, family-based treatment, comorbidity, anxiety, qualitative research, add-in module, self-efficacy, treatment effectiveness, young persons, thematic analysis.*

GJMR-L Classification: LCC: RJ499.3



Strictly as per the compliance and regulations of:



Addressing Comorbid Anxiety in Family-Based Treatment for Adolescent Anorexia Nervosa: User Experiences and Perspectives

Rikke Barslund Gregersen ^α, Viktoria Vinther Ottsen ^σ, Irene Lundkvist-Houndoumadi ^ρ,
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Abstract- Purpose: This study examines three families' experiences of the influence of comorbid anxiety on the effectiveness of family-based treatment (FBT) for anorexia nervosa (AN) and the effect of an add-in module addressing comorbid anxiety, and how this might interact with the families' work on AN and the young person's (YP's) sense of self-efficacy.

Method: Qualitative interviews were carried out with three families, who had been offered an add-in module at The Child and Adolescent Mental Health Centre of the Capital Region of Denmark. All interviews were analysed using thematic analysis.

Results: Participants had either childhood emotional disorder, generalized anxiety disorder or social phobia as a comorbid condition to AN. All families experienced that anxiety symptoms limited the effectiveness of FBT, leading to stagnation. Two of three families found the add-in module helpful, attributing recovery from AN to that. These two families highlighted home assignments with challenging and obtainable goals, consciousness-raising with respect to the mechanisms of anxiety, and the focus on identifying small successes in therapy as being crucial for the process of recovery. The third family experienced it as yet another manual not fitting their needs. The add-in module had a positive influence on the self-efficacy in all the YPs, regarding their feelings of being able to handle the eating disorder. The module further helped parents and YP establish a shared language of challenges and a collaboration around treatment goals.

Discussion: The testimonies point to the necessity of addressing comorbid anxiety earlier in treatment, as it may hamper work on YP's autonomy and self-efficacy in phase two of FBT. The study highlights the importance of increasing the YP's belief in their ability to cope with difficult situations via individual and relevant goals. Further, it is argued that a good match between treatment approach and family is crucial and that addressing comorbid anxiety within the framework of FBT may be a means to this end for some YPs with AN and comorbid anxiety. The findings suggest that combining

interventions in the face of comorbid conditions may add to treatment efficacy in the field of AN treatment via increasing self-efficacy and parental empowerment.

Keywords: anorexia nervosa, family-based treatment, comorbidity, anxiety, qualitative research, add-in module, self-efficacy, treatment effectiveness, young persons, thematic analysis.

1. INTRODUCTION

Anorexia nervosa (AN) is a serious mental disorder most often debuting in adolescence. It has the highest mortality rate among mental disorders and may have dire consequences for the young person's development (Arcelus et al., 2011; Steinhausen & Jensen, 2015). Family-based treatment (FBT) is first choice treatment for anorexia nervosa (AN) in young persons (YPs), with recovery rates around 50% depending on studies and recovery criteria (Couturier et al., 2013; Lock, 2019). FBT focuses on empowering parents to support their child to eat well and get well, and it consists of three phases. In phase one, parents are instructed to take responsibility for the YP's eating and prevent disturbed behaviours. Phase two focuses on gradually returning age-appropriate control of eating and autonomy to the YP, and phase three focuses on returning to normal life and preventing relapse, as described in the treatment manual by D. Lock and D. Le Grange (Lock & Le Grange, 2015). While effective for many, a subgroup of patients shows less optimal response to FBT, wherefore additional interventions are needed.

Anxiety disorders are frequent among individuals with AN with a lifetime prevalence of around 60% (Kaye et al., 2004). Anxiety has been proposed as a vulnerability factor for AN, and emotional avoidance is suggested as a possible mediating factor between AN and anxiety (Kerr-Gaffney et al., 2018). Further, comorbid anxiety disorders have been associated with poorer outcome (Lock et al., 2006) and longer course (Lim et al., 2023) in treatment of AN in YPs. These findings suggest that comorbid anxiety may be a maintaining factor for AN that may need to be addressed in order to treat AN.

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Evidence is not clear on whether comorbid anxiety should be addressed during FBT for AN, or rather later if symptoms persist after completing treatment. The FBT literature recommends mostly postponing anxiety treatment until AN is resolved (Lock & Nicholls, 2020). Based on clinical experience however, we hypothesize that comorbid anxiety is a maintaining factor in FBT as it impedes YPs' returning to social life after the parent-led renourishment in phase one, thereby counteracting the second phase of FBT, which focuses on restoring YPs' autonomy and self-efficacy around eating. In sum, we suggest that overall effectiveness of FBT may be improved if comorbid anxiety is addressed in a way that strengthens the YP's ability to gain independence and return to social life.

In search of ways to improve the effectiveness of FBT for YPs with less optimal outcomes, we developed and pilot-tested a manual addressing anxiety in FBT (add-in module) (Lundkvist-Houndoumadi & Bentz, 2021). The add-in module is offered when comorbid anxiety is diagnosed and deemed by the therapist and the family to impede response to FBT. It consists of 12 sessions, is based on a cognitive-behavioural approach, and is administered as part of the FBT sessions focusing on empowering parents. It aims to supply the family with a shared understanding of anxiety symptoms, increase awareness of the intertwining between anxiety and AN, and provide the family with tools to overcome anxiety, which may stand in the way of AN recovery.

Knowledge is scarce regarding user perspectives of families with a child with AN and comorbid anxiety when they receive standard FBT, let alone their perspectives on receiving a manualized treatment component targeting the anxiety disorder. Consequently, the present study is not hypothesis-testing, but exploratory in nature. Our aim was threefold: a) to understand whether patients and parents in FBT for AN experienced comorbid anxiety to influence the effectiveness of FBT, and if so, how they described this influence; b) to understand the families' experience of a cognitive-behavioural module targeting anxiety, with a focus on how this might interact with the families' work against AN and c) to understand whether the add-in module increased the YPs' sense of self-efficacy.

II. METHODS

Participants were families with a YP (12-17 years old) that a) gave consent to contribute to an ongoing study investigating the response to FBT for AN in a government-funded Child and Adolescent Mental Health Centre (Bentz et al., 2021), b) were offered the add-in module because the YP was diagnosed with a comorbid anxiety disorder that was deemed by therapist and family to be impeding response to standard treatment (FBT), and c) were invited to an interview

about their experiences. The overarching study by Bentz et al. (2021) demonstrated that FBT can be demonstrated in standard care with 57% successfully completing treatment within 12 months (Bentz et al., 2021). By the beginning of the present study, three families had experienced a course of add-in treatment as an adjunct to their FBT (Table 1), and they all agreed to a 45-minute interview providing a written informed consent. Three out of five interviews were carried out at the treatment unit, whereas the fourth and fifth interviews were carried out online via Microsoft Teams.

An interview guide was developed based on the following themes: a) the YPs' history with anxiety and eating disorder, b) the families' hopes for and subjective definitions of treatment effect, c) the families' experience of the effectiveness of standard FBT and the extent to which anxiety symptoms interacted with it, d) the experienced effect of the add-in module, and e) the YPs' sense of self-efficacy during treatment. Themes a) and b) form the basis for understanding the families' experiences, while themes c) and d) evoke lived experiences when comorbid anxiety is not addressed, and when it is addressed, respectively. Lastly, theme e) uses the theoretical construct of self-efficacy as a lens through which to understand the families' experiences. To ensure the quality of the collected data great emphasis was placed on conducting continuous monitoring to ensure that the interviewer's interpretation of what was said corresponded with the interviewees' experiences.

The interviews were transcribed and analysed using the thematic analysis of (Braun & Clarke, 2006). Thematic analysis is a qualitative analytical method for systematically organising, interpreting, and reporting of qualitative data. It involves the phases of a) familiarization with the data by reading and re-reading the transcripts, b) generating initial codes in each transcript, c) searching for themes across transcripts, d) reviewing themes, and e) defining and naming the themes. The thematic analysis was carried out by collaborative coding by the first and second author, focusing on expanding each other's interpretation of the data and thereby seeking to deepen the reflective process until a full agreement on final themes was reached, thereby establishing a consensus-based inter-coder reliability. All five interviews were coded before generation of potential themes. Results of analyses was shared with informants. The presented results summarize the key findings from the generated themes.

III. RESULTS

See table 2 for exemplifying quotes (Q).

a) *Influence of comorbid anxiety on the perceived effectiveness of FBT*

Overall, the interviewed families experienced comorbid anxiety symptoms to be limiting the

effectiveness of FBT leading to stagnation with respect to the intended treatment objectives in the given phase of FBT. Parents acknowledged that weight restoration is a necessary first step and a prerequisite for dealing with other problems. However, they experienced that their daughters' anxiety escalated, when met with the pressure of weight gain (Q1; Q2). Amanda's mother described how they were taught to handle anxiety attacks but lacked the tools to understand and prevent them (Q3). Furthermore, Beth described that her anxiety symptoms made it difficult to recover from AN, since the gradual returning to a normal social life, in phase two and three of FBT, were impossible; leaving home to be with friends triggered an intense fear of death and panic attacks, which hindered progression in the treatment of her AN (Q4). A common experience in all the families was a lack of strategies for dealing with the anxiety and a feeling that FBT was insufficient in this regard. The interviews this indicate that comorbid anxiety may challenge both the central treatment objective of weight gain in phase 1 of FBT and the objective of returning to a normal social life with the consequent need for age-appropriate responsibility for eating in phases 2 and 3 of FBT.

b) Families' experiences of an add-in module targeting comorbid anxiety

i. Develop a shared language

All interviewed families felt the integration of interventions for anxiety and AN to be meaningful, adding to the effectiveness of FBT. Involving parents in the intervention established a shared language between parents and YPs, making it possible to talk about anxiety and verbalize the progression, thereby helping parents support their daughters (Q5). From Amanda's perspective, the development of a shared language regarding the anxiety enabled her to understand and express her feelings, thereby increasing her ability to seek support from parents and friends (Q6).

ii. Small victories contribute to recovery

Amanda, Claire, and their parents found the interventions of the add-in module helpful and attributed the recovery from AN to the add-in module (Q7). Families emphasized the following elements as particularly relevant to the recovery: home assignments with challenging and obtainable goals using a stepladder approach, consciousness-raising with respect to the mechanisms of anxiety, and the focus on identifying small successes in therapy. As an example, Amanda underlined that one of her overall goals of eating in the classroom seemed completely impossible during FBT. However, small victories obtained during the add-in intervention, targeting her anxiety, such as paying in the supermarket, made this goal feel more realistic over time, eventually leading to its attainment (Q8).

iii. Flexibility is needed in a manualized approach

Beth found the cognitive restructuring work insufficient to match her experience of anxiety. This mismatch felt to be due to the fact that the exercises were centred around the identification of trigger thoughts, whereas she experienced that her anxiety began with an intense physical feeling of discomfort (Q9). Beth felt that the manual exercises overlooked the uniqueness of her experiences. After a few weeks of working with the manual and lack of desired results, the therapist initiated a deviation from the add-in module as well, which had a positive impact on Beth's feeling of "being seen" (Q10).

iv. Returning to social life made possible

The analysis further found returning to social life outside the family to constitute a meaningful indicator of treatment efficacy for all YPs and parents. Claire felt the social aspects were emphasized more in the add-in module compared to FBT. This made a significant difference for her motivation to recover from AN, because the treatment focused on social aspects of her life that she wished to return to (Q11). Even Beth, who did not experience the add-in module's interventions as crucial for her improvement, expressed that additional treatment targeting her anxiety had made a significant impact on her beliefs in her own abilities, especially in regard to returning to social life. Thus, learning strategies to handle anxiety made returning to social life more plausible, which in turn motivated the YPs to recover from AN, because they were working towards an objective of significant personal importance.

c) Self-efficacy

The add-in module was found to have a positive influence on self-efficacy in all the YPs regarding their feelings of being able to handle the eating disorder. For all the families, this positive influence was associated with parental encouragement and verbal support, which were made possible by the parents' involvement in the add-in module (Q12). For Amanda and Claire, the positive association between the add-in module and the development of self-efficacy was furthermore connected to success experiences they acquired during the anxiety treatment. Amanda experienced that she was more likely to obtain success in the add-in module, due to the focus on smaller and more realistic goals, compared to the FBT treatment objectives. She described how working on small goals and fulfilling them constituted significant success experiences that could be transferred to other more difficult goals related to the AN (Q13). Claire experienced being able to work on what she perceived to be more challenging goals than in the pure FBT (Q14). Even though she was nervous about it, this work gave her the opportunity to obtain success experiences, which could be transferred to other challenging situations regarding the AN. Thus, Amanda and Claire experienced the goals in the add-in module

as more adjusted to their individual needs. These findings are in line with Bandura's (Bandura, 1997) argument that success experiences can lead to generalizable skills, which can be used across stressful situations in everyday life and thereby develop a YP's self-efficacy. For Beth, anxiety medication, and not the success experiences stemming from the add-in module, led to her becoming less responsive to bodily sensations, which was crucial for the development of self-efficacy in relation to social aspects of her recovery, such as eating in school, having a job, going to parties etc. (Q15).

IV. DISCUSSION

Interviewed families experienced comorbid anxiety as challenging the effectiveness of FBT, especially in phase two, because it hampered the YPs' engagement in social life, which is normally a major motivation for fighting AN and prevented the development of skills to resist AN behaviors. The interviews, hence, shed light on a crucial aspect of the treatment process, that is often overlooked and contributes to the existing literature. In extension, an anxiety disorder might act as a maintaining factor for AN, because AN provides opportunities to avoid feared situations beyond those related to weight and shape. The analysis further showed that two of the three families found a cognitive-behavioural module targeting anxiety helpful, and supporting recovery from AN.

The descriptions of anxiety disorders as hampering the YPs' recovery from AN may appear contrary to the recommendation of postponing treatment of comorbid disorders until AN is resolved (Lock & Nicholls, 2020). However, testimonies from the three families point to the necessity of addressing comorbid anxiety earlier, as it appears to hamper work on YPs' autonomy and self-efficacy in phase two of FBT. Furthermore, we consider the add-in module in line with the central FBT principle of parent empowerment to support their YP since the families described the add-in module as helpful in creating a shared language and shared strategies towards anxiety, such as the stepladder approach to hierarchical exposure.

It is important to bear in mind that these findings are derived from qualitative analysis of a small number of interviews. The validity of qualitative analyses is not based on statistical significance but on rich descriptions that exemplify the focus area of study and allow generation of hypotheses for further testing.

Two aspects of the analysis add to our understanding of what families may need when progress in FBT seems hampered by comorbid anxiety disorders. One aspect is the active involvement of the YPs in goals that seem relevant to them, and the other is the families' need to "feel seen" by the treatment team when addressing what is relevant to the specific family.

We hypothesize that the active involvement of YPs in setting attainable goals in the add-in module may have been easier to achieve when addressing anxiety rather than AN. Anxiety is most often ego-dystonic, whereas the YP may be ambivalent regarding AN. Interestingly, two of the YPs described being more motivated to work towards healthy eating and letting go of AN in the process of tackling anxiety. Cognitive-behavioural therapy rests on a collaborative process of goal setting and empiricism, techniques that explicitly engage the YPs (Tee & Kazantzis, 2011). This is not in contrast to the stance of phase two of FBT, but the FBT model provides fewer techniques for engaging the YP in phase two, and there may be a risk that families and therapists unwillingly continue the strong emphasis of parent-led change from phase one into the later phases of FBT. This might be a focus for further studies on the processes of change in FBT. The present study serves to highlight the importance of increasing the YPs' beliefs in their ability to cope with difficult situations via individual and relevant goals and underlines that an increased self-efficacy may support AN recovery as well. In extension, early screening for anxiety or another comorbidity that interfere with YP's self-efficacy and addressing it might add to outcomes of FBT.

Lastly, all three participating families noted the importance of "being seen". Two families experienced this when the treatment team deviated from standard FBT and addressed comorbid anxiety. The third family experienced the add-in module to be yet another manual not fitting their family and didn't feel seen until treatment deviated from the add-in manual. These descriptions underline the notion that "*one size does not fit all*" when it comes to adolescent AN treatment. Additionally, they touch upon the therapeutic dilemma that individualized adaptations may support alliance building on the one hand, but on the other hand there is a risk of hampering effectiveness of an evidence-based treatment model when adapting it. . We argue that a good match between a treatment approach and a specific family is essential and addressing comorbid anxiety within the framework of FBT may be a means to this end for some, albeit not for all YPs with AN and comorbid anxiety.

Table 1: Descriptive information on informants

Pseudonym of young person	Amanda	Beth	Claire
Age at treatment start	12	17	16
Primary diagnosis of ED (ICD-10)	F50.1 atypical AN	F50.0 AN	F50.1 atypical AN
Reason for not fulfilling a typical AN diagnosis of F50.0 (ICD-10)	weight loss less than 15% of body weight, still menses		still menses
Comorbid anxiety diagnosis (ICD-10)	F93.8 Other childhood emotional disorders	F41.1 Generalized anxiety disorder	F40.1 Social phobia
Additional Comorbid diagnoses (ICD-10)			F43.2 Adjustment disorder with depressive symptoms F98.8 Attention deficit disorder
Interview format	parent and YP together	parents and YP separately	parents and YP separately
Months of standard FBT prior to anxiety add-in module	9.5	2.5	2.5
Number of anxiety add-in module sessions completed	12	5	12
Months to complete successful ED treatment after ending anxiety add-in module	0	Unknown [†]	3
Medication for anxiety (SSRI)	no	yes	Yes

Legend: ED= eating disorder; AN= anorexia nervosa; ICD-10= International Classification of Diseases, 10th edition

[†]Continued ED treatment in the Adult Mental Health Services

Table 2: Exemplary quotations from qualitative interviews

Quotation number	Quotation
Q1	<i>"It also escalated. Every time [Amanda] was pressured to eat more, or well...every time we pressured her just a little, then she got so much anxiety"</i> Amanda's mother
Q2	<i>"It is just a completely different kind of anxiety, panic anxiety, that she suddenly started getting. We haven't experienced that at any time....It just got like really full blown after the eating disorder...I think the more we experience the eating disorder to maybe move a bit out of our home, then it is like, then panic and anxiety comes, right?"</i> Beth's mother
Q3	<i>"And the anxiety attacks were centered around the eating disorder, and they didn't get any better [during FBT]. I got knowledge on how I could manage a specific panic attack, but I just didn't get any tools to prevent it, or to understand what happened"</i> Amanda's mother
Q4	<i>"We also worked on a step ladder, where you should get higher and higher up, and you should like go out with friends and it was like part of being free, and something like that. But then anxiety came upon me, which gave me the fear that something would happen if I went out, then I will start feeling pain in my body or then I will die, and then I might as well stay at home...so that definitely made it more difficult to get well"</i> Beth
Q5	<i>"We have completed homework and in that way we followed it [the add-in module] and had some good talks because it has also opened up for something, because I could then talk with [Beth] in a different way, because we had sat in this room and listened to something together and then I could better be curious"</i> Beth's mother



Q6	<i>"I really think it has become easier to tackle [the anxiety], and I talk more with my mother about what it is that I worry about. Before I just couldn't...it was just too much. But concerning my worries I can now talk with others about my worries in a way so that they can help me"</i> Amanda
Q7	<i>"I don't think she would have gotten well...without it [the add-in module]"</i> Amanda's mother <i>"I am sure that [Claire] would not have gotten to this point without it [the add-in module]"</i> Claire's mother
Q8	<i>"Now that I had achieved the small victories, I also felt more like I could achieve the bigger goal about eating, because it sounded completely impossible in the beginning. Yes, the small victories made the goal concerning eating in class more realistic"</i> Amanda
Q9	<i>"We had to follow a lot of papers, and there was like a plan for what you should go through. And I just could feel after the three first sessions that nothing happened. Everything focused on me finding my problem, but part of my problem is that it starts with me feeling it [anxiety] in my body, and then it goes on, so...I didn't know what the problem was, I only knew that my body triggered a lot of it. So it was a bit like...it just didn't work for me. It [the add-in module] didn't really match my anxiety illness"</i> Beth
Q10	<i>"If I could change something about it [the add-in module] for others, then it would be to look more at the individual, rather than at the illness as something you need to follow in a book. But I was lucky, since I got the form altered a little bit"</i> Beth
Q11	<i>"It was really the social part to me wanting to get my life back, because I really didn't feel that I had a life back then. And then we got to talk more about that, especially in the add-in, but before that, we stuck a lot to the phase we were in. And that I really found difficult, because I was not at all motivated to look at that [weight] curve, to see the weight go up, it was like the contrary. So, it would really have been awesome if it was more focused. And we did that maybe a little bit, we talked about what I wanted to, but I wasn't allowed to do anything. So, I think it would have helped, if I was allowed to do a bit more and could see the positive side"</i> Claire
Q12	<i>"Well I think, that it [the daughter's belief in being able to overcome difficult situations] came rather late in treatment, but it's due to...these assignments that are being carried out where she has to... get her own experiences and experiences of course takes time. So it came in the last part of treatment, if you can say it like that...then we could look back, like: "do you remember when we sat here, now you can, like..." I mean... and then I think she starts realizing: "what earlier seemed like just a talk I can actually now see, without me being able to counterargue, that it actually has an effect..." And that is what we need to continue working on. That is what we feel leads to an immense change, like...it is about expressing that it is difficult, and then afterwards finding out "okay now I have actually progressed"</i> Claire's father
Q13	<i>"Interms of the eating disorder [the treatment before the add-in], then it was like one big step after the other, and it was like impossible to obtain a goal. In terms of the anxiety [the add-in module] then it was more like there was a small step, then a bit bigger step, and then it varied a bit how big the steps were"</i> Amanda

Q14	"Yes, and I got the chance to actually do some of the things that I actually wanted to, although I was super afraid of it, I was allowed to...the more things I wanted to do and I was allowed to do, the more I also believed in myself and I could take it with me to the other things, if that makes sense" Claire
Q15	"I think most of it has gotten better. I also really feel it when I go to school or work. It [anxiety medication] has just helped me so much to be able to think about something different than what the anxiety gets you thinking" Beth

Data availability statement

Qualitative interview raw data will not be made available, but anonymized citations and codes from thematic analysis may be shared upon reasonable request.

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Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Author contributions

MB & ILH designed the intervention, VVO and RG developed the interview guide and collected, analyzed, and summarized data, ILH and SHP discussed the findings and related them to existing literature, VVO and RG and MB wrote the main manuscript, all authors reviewed the manuscript.

Consent to participate

All participants gave informed consent and read the manuscript draft.

Ethics approval

The Danish Data Protection Agency approved the main study of which this study was part. All data was managed according to the prescription of the Data Protection Agency.

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Acknowledgments

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The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.



Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
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- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
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Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

- a) A title which should be relevant to the theme of the paper.
- b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
- c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
- d) An introduction, giving fundamental background objectives.
- e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
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- g) Suitable statistical data should also be given.
- h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
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The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

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One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in a research paper?" Then consider synonyms for the important words.

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Numerical methods used should be transparent and, where appropriate, supported by references.

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Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

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Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

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Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



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TIPS FOR WRITING A GOOD QUALITY MEDICAL RESEARCH PAPER

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12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

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Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

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15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

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INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

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- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

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The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

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- Submitting a manuscript with pages out of sequence.
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- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
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Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
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- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

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The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.



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- Explain the value (significance) of the study.
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Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

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Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

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- Resources and methods are not a set of information.
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The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



INDEX

A

Adipose · 17
Appetite · 16, 18, 19
Aspiration · 1, 6, 7, 8, 14, 15

C

Concentric · 3, 10

D

Deworming · 19

E

Excruciating · 18

H

Homogenize · 3, 10

M

Mastication · 8

P

Porridge · 1, 5, 6, 7, 8, 12, 14, 15

R

Rehabilitate · 19

S

Susceptibility · 16

V

Viscosity · 1, 3, 4, 5, 6, 8, 10, 11, 12, 14



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