

Full Length Research Paper

An exploratory investigation of individual and school-level determinants for effective nutrition education in primary school in N'Djamena, Chad

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Abstract

Background. Malnutrition is a serious public health problem in Chad, with prevalence increasing over the years. Most eating habits are formed early in life, with beliefs and tacit knowledge directing eating behaviors. School nutrition education can effectively improve nutrition skill if related social determinants are understood. This study investigated factors for effective school nutrition education in N'Djamena, Chad. **Methods.** A total of 73 children (girls and boys, age 9-13) were stimulated with a nutrition education initiative in two schools in N'Djamena. The nutrition education focused on food groups and their importance, food hygiene, and general rules for a balanced diet based on local foods. **Results.** Socioeconomic and sociocultural factors affected nutrition education. Girls were more proficient than boys, probably due to the role they generally have in dealing with family eating. Results confirmed the children's developmental stages related to nutrition, and showed the significant impact a nutrition intervention can have on the nutritional skills of Chadian children. **Conclusion.** Formative research is needed to design school nutrition education programmes in Chad, where limited studies have been conducted so far.

Keywords: Nutrition security, diet, hygiene, nutrition education, children, Chad.

INTRODUCTION

Severe acute malnutrition (SAM) in children under 5 years is one of the leading causes of morbidity and mortality in Chad. More than half of the regions/provinces of Chad are in a malnutrition situation according to studies (SMART, 2021). SAM includes stunting (height for age), wasting (weight for height), underweight (weight for age) and micronutrient deficiencies (i.e. inadequate/imbalanced intake of essential nutrients, such as vitamins and minerals) (Roberfroid et al., 2015). SAM resulted as associated with diarrhoea, fever, vomiting, and type of complementary meal.

At household level, it is associated with undernourished caretaker, caretaker's handwashing habits, absence of toilet, and low household food diversity (Dodos et al., 2018). Poor knowledge regarding causes, such as unbalanced nutrients intake, poor hygiene and sanitation, and consequences of malnutrition results in reduced risk perception and disbelief or disregard of nutritional education. Nutritional awareness and skills will contribute breaking the intergenerational cycle of malnutrition and protect people against the risks of the worldwide nutrition transition (Frazzoli and Mantovani, 2020). Most eating habits are formed early in life, therefore it is important that children receive nutrition education in primary school. Context-specific scientific literature on nutrition education

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in Chad is very limited. This study began investigating individual and school-level determinants for effective nutrition education in school in N'Djamena. Indeed, formative research allows to describe the target group, understand the dynamics among factors, and design a context-specific road to effective and structural school nutrition education in Chad.

MATERIALS AND METHODS

Two primary schools in N'Djamena, namely the *Georges Washington* school and the *Notre Dame des Apôtres* school, were selected for this study. Primary schools in N'Djamena are mostly private, such as the *Georges Washington* school. The school *Notre Dame des Apôtres* is supported by the Chadian state instead, and is a semi-state school.

A nutrition education session was held at the *Notre Dame des Apôtres* school (on January, 2020) with 27 children aged 10 to 13 years old (average 11 years old). The second education session (on February, 2020) was held at the *George Washington* school, N'Djamena, with 46 children aged 9 to 12 years old (average 10 years old). In both schools, all children, in the middle course classroom, participated on voluntary basis. A large classroom has been made available in the two schools to the team to bring the children together.

The nutrition education session focused on food groups and their importance, food hygiene, and general rules (food pyramid, food selection, dietary diversity) for a balanced and diversified diet based on local foods (Supinya *et al.*, 2012).

The nutrition education targeted the needs of the urban community in Chad. In particular, N'Djamena urban community is characterized by low consumption of fruit and vegetable. The education session was based on reviewed training materials developed by the government led programme in Chad. The nutrition education was provided by members of the NGO *NOODLES CHAD* trained in nutrition, education and health. Questionnaires (pre- and post-) were used to assess the effectiveness of the lesson. Learning was ranked low (score 0-3), medium (score 3.5-6), or good (score 6.5-10).

The comparison between nutrition skill score of groups of children in schools was taken as indicator of socioeconomic status. The comparison between nutrition skills of boys and girls was observed as indicator of socio-cultural factors.

RESULTS

The overall mean final score was 6.16 for the group of children with mean age 11 (school *Notre Dame des Apôtres*) and 6.73 for mean age 10 (*George Washington* school), thus indicating age 10 as more benefiting from the course. The overall mean background score was 3.72 at semi-state school *Notre Dame des Apôtres* and 4.17 at private *George Washington* school.

Figure 1 shows the learning rate before (in blue) and after

(in red) the nutrition education session at the school *Notre Dame des Apôtres*. Before education 42% of children score low, 53% medium and 3% good. After the nutrition education session, just 3% of children score low, 46% medium and 50% good. We noted a marked improvement in the knowledge of basic nutrition by schoolchildren.

Figure 2 reports the learning rate before (in blue) and after (in red) the nutritional education session at the school *George Washington*. Before the nutrition education session, 43% of children score low, 34% medium, and 21% good; after the nutrition education session just 6% of children score low, 23% medium, and 69.5% good. Before the nutrition education session, schoolchildren had limited basic knowledge on nutrition, with some higher knowledge in girls.

In **Figure 3**, we can see the comparison of learning score before and after the nutrition education session between boys and girls at the school *Notre Dame des Apôtres*. Before education overall score of boys and girls was respectively 3.4 and 3.8. After education, their score was 5.8 and 6.3 respectively.

Figure 4 shows the comparison of learning score before and after the nutrition education session between boys and girls at the *George Washington* school. Overall score of boys and girls was 3.5 and 5.1 respectively before education session. This score was 6.6 for boys and 7.0 for girls after education.

The final overall score at *Notre Dame des Apôtres* and *George Washington* schools (respectively 6.2 and 6.7) indicates a huge improvement respect to background score (3.7 and 4.2 respectively) (Figures 3,4) and therefore the significant impact a nutrition intervention can have on the nutritional skills of Chadian children.

Girls were both more proficient (final score) and more prepared (background score) than boys in this nutritional education. After the nutrition education, the average score of the children from school *Notre Dame des Apôtres* by sex is 6.34 for girls (background 3.84) and 5.75 for boys (background 3.43). At *George Washington* school the average score by sex was 6.97 for girls (background 5.05) and 6.66 for boys (background 3.50).

DISCUSSION

In the present study, we approach the Chadian nutrition education scenario in terms of social determinants. Social determinants of health refer to a specific group of social and economic factors within the broader determinants of health (Marmot, 2015). These relate to an individual's place in society and include factors like education, environment, social and community context, healthy food, economic stability, and health care. For instance, according to Ahinkorah *et al.* (2020), determinants of under-five mortality in Chad are education, sex, and birth

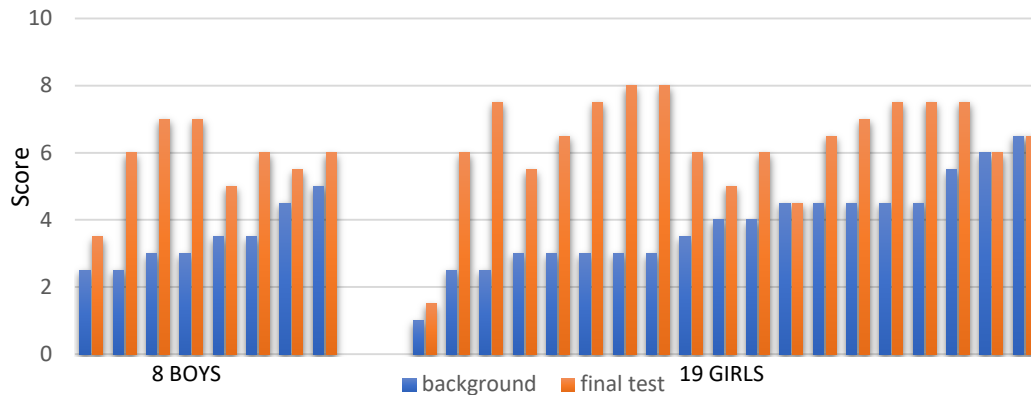


Figure 1. Nutrition education before and after teaching at the *Notre Dame des Apotres* school, N'Djamena, Chad.

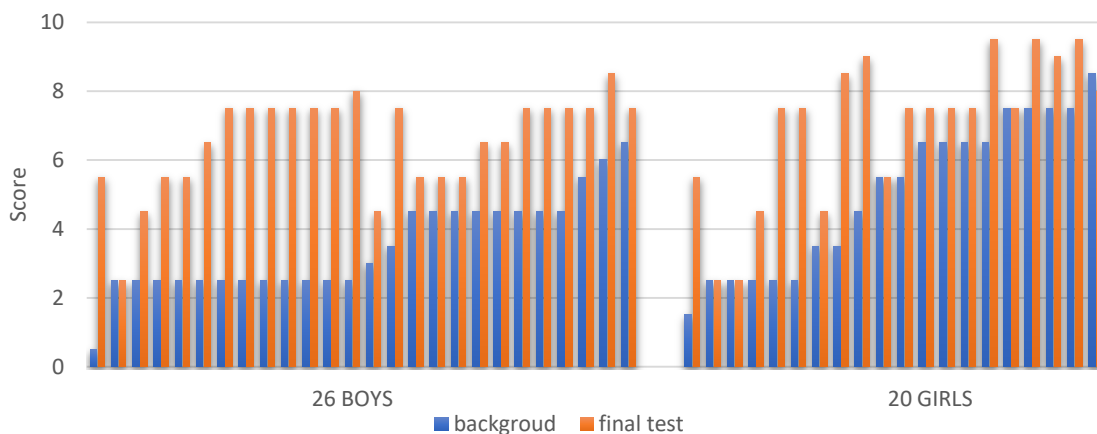


Figure 2. Nutrition education before and after teaching at the *George Washington* school, N'Djamena, Chad.

rank. Socio-economic and proximate factors do impact on health disparities in Chad, including nutrition and related skill. Children were more proficient at *George Washington* school (private school) than in semi-state school, this socioeconomic factor possibly being explained by higher education grade and/or health seeking behaviour of the mother (Figure 1).

In both schools we found that girls have both better background knowledge and ability to improve in nutrition and knowledge of local foods than boys (Figure 3 and 4). This could be due to the roles that girls generally have in dealing with family eating. In fact, it has been found that effectiveness of nutrition intervention on school-age children increases with interventions on preschoolers'

abilities to understand concepts related to edibility, nutrition, and digestion based on their food and eating experience (Schultz and Danford, 2016; Nicholson et al. 2018). Boys also go to school, and are more likely to go further on in their studies. Boys usually help their dads in their business, e.g. sales at the market, bicycle repair business, convenience store or desk job.

In a study carried out by the ASNUTRI organization in 2019 at the college *Savoir Partage* in N'Djamena, children in the 5th class had no knowledge of basic nutrition before the nutrition education (65% of them had a poor score, 30% a low score, and only 5% had a medium score). The nutrition education resulted in 60% children with good score, 25% with medium score and 5%

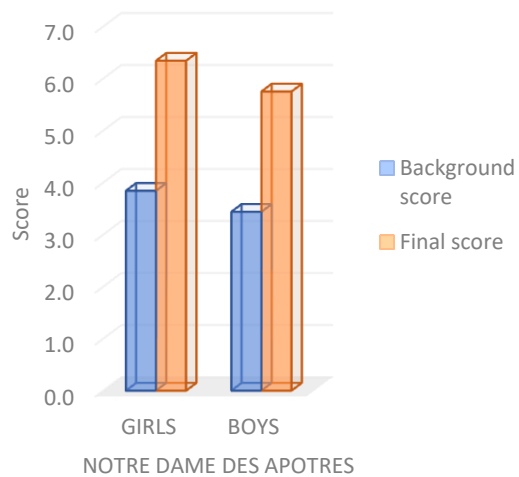


Figure 3. Proficiency in nutrition before and after the training education (27 children) at the *Notre Dame des Apôtres* school.

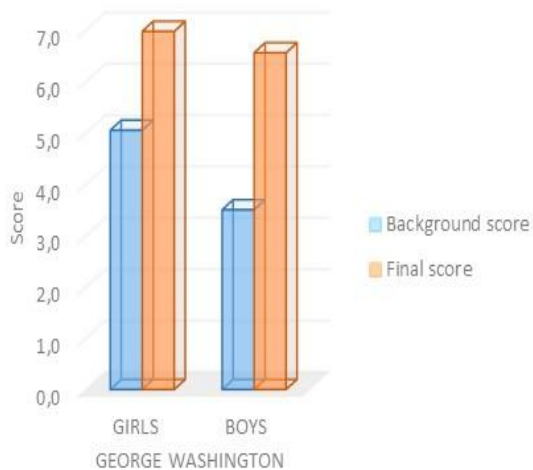


Figure 4. Proficiency in nutrition before and after the training education (46 children) at *George Washington* school.



Figure 5. The attention to hygiene. A reminder to regularly wash your hands on the wall at the *Georges Washington* school.

with low score (ASNUTRI, 2019). The present initiative of nutrition education confirmed these trends, with 50% and 69.5% good score, 46% and 23% medium score, 3% and 6% low score at the *George Washington* school and *Notre Dame des Apotres* school, respectively (Figure 1). Indeed, school-age children can identify factors that

influence their decisions about eating, as well as barriers to being healthy (DeCosta et al., 2017).

Nutrition education is more likely to be effective when it focuses on behavior and action rather than only knowledge e.g. school gardening, cooking, and accessibility to fruits and vegetables (Kyereet al., 2020).

Research is needed for understanding food taboo, beliefs and tacit knowledge that may differ from declarative knowledge. These are more influential in directing eating behaviors than declarative knowledge or knowing facts about food, nutrition, the body, or health ([Schultz and Danford, 2016](#)).

Inadequate diet but also hygiene and other factors are behind micronutrient deficiency, thus motivating combined interventions (Fankam et al., 2022).

The planning of equitable interventions to face malnutrition requires the understanding of both inequalities, such as access to drinking water (Lemoine and Tounian, 2020; Ntouda et al., 2013), and differences, such as cultural rooted habits (Frazzoli et al., 2016)

In the Mondo and Mao districts, Kanem region of Chad, where acute malnutrition is prevalent, intestinal parasitic infection is widespread and attributable to water quality. Interventions aiming at improving water quality at household level or at promoting handwashing with soap and clean water storage container significantly reduce diarrhea incidence (Altmann et al., 2018). Intestinal parasites impair the absorption and digestion of nutrients, thus motivating environmental prevention of parasite cycles, improved sanitation, hygiene education (figure 5), and eventually community deworming (Rivero et al., 2018).

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CONCLUSION

This study confirmed some of the determinants in nutrition education at individual and school level. Further efforts in the analysis of health disparities often associated to others factors are needed to address malnutrition in Chad.

Results showed the significant impact of nutrition education on the nutritional skills of children, and how girls were more proficient than boys in nutrition education. As closing remarks, we can state that nutritional knowledge, attitude and practices of children in Chad must be addressed in terms of food pyramid and diversification, nutrition security, hygiene and safety. Training materials for nutrition education of children as well as educational messages targeted to local food culture and needs should be developed.

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