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Rapid acceptability and adherence testing of a lipid-based nutrient supplement and a micronutrient powder among refugee children and pregnant and lactating women in Algeria

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1 **Abstract**

2

3 *Objective:* To assess the acceptability and adherence to daily doses of lipid-based nutrient
4 supplement (LNS) amongst children and micronutrient powder (MNP) amongst children and
5 pregnant and lactating women.

6 *Design:* Household interviews and sachet counting were conducted to measure acceptability
7 and adherence, 15 and 30 days after product distribution. **Qualitative information on product**
8 **acceptability was collected using focus group discussions.**

9 *Setting:* Saharawi refugee camps, Algeria, August - October, 2009

10 *Subjects:* LNS was distributed to 123 children aged 6-35 months (LNS-C), and MNP to 112
11 children aged 36-59 months (MNP-C) and 119 pregnant or lactating women (MNP-W).

12 *Results:* At the end of the test 98.4% of LNS-C, 90.4% of MNP-C, and 75.5% of MNP-W
13 participants reported that they liked the product ($p < 0.05$). Other measures of acceptability did
14 not differ. Median consumption of sachets was highest in the LNS-C group ($p < 0.001$).
15 “Good” adherence to the daily regimen (consumption of 75-125% of recommended dose) was
16 89.1% in the LNS-C, compared to 57% in the MNP-C and 65.8% in the MNP-W groups
17 ($p < 0.001$). Qualitative findings supported the quantitative measures and guided selection of
18 local product names, packaging designs, distribution mechanisms, and the design of the
19 information campaign in the subsequent programme scale-up.

20 *Conclusions:* Acceptability, consumption, and adherence were higher in participants receiving
21 LNS compared to MNP. However, both products were found to be suitable when compared to
22 pre-defined acceptability criteria. Acceptability studies are feasible and important in
23 emergency nutrition programmes when the use of novel special nutritional products is
24 considered.

25

26

27 Saharawi refugees have been hosted in camps in Tindouf, Southwest Algeria since 1975.
28 Since that time the Government of Algeria has supplied relief items. The United Nations High
29 Commissioner for Refugees (UNHCR) has supported the government in meeting refugees'
30 basic needs and opened an office in Algiers in 1985. The World Food Programme (WFP) has
31 supplied food assistance since 1986, and a range of donors and bilateral arrangements
32 currently support the refugee population. Anaemia and chronic malnutrition were major
33 public health problems, affecting 62% and 32% of children aged 6-59 months in the Saharawi
34 refugees camps in Algeria in 2008 (1). Similarly, anaemia prevalence was high in women,
35 reaching 54% in 2008 (1). A previous trial carried out in 1999 using a high nutrient density
36 spread for six months showed positive benefits in correcting retarded linear growth, and
37 reducing anaemia and stunting in children (2). However, the use of this type of spread was not
38 continued and anaemia prevalence in young children almost doubled after the end of that
39 intervention.

40 In 2009, as part of the UNHCR's Anaemia Strategy (3), two special nutritional
41 products, namely a lipid-based nutrient supplement (LNS) and a micronutrient powder
42 (MNP), were proposed for use in blanket supplementary feeding programmes as part of a
43 prevention strategy to address the problems of anaemia and stunting. These two products were
44 chosen due to the positive outcomes shown in recent studies. Studies in Malawi (4, 5) and
45 Ghana (6, 7) showed a promising impact on linear growth, iron status, and motor
46 development when the LNS was added to the diet in small amounts (about 20-75 g / day).
47 Bioavailability studies on MNP have shown that iron is well absorbed in infants (8, 9), and
48 multiple randomised studies have demonstrated the efficacy of MNP in treating anaemia in
49 young children (10).

50 The acceptability of various LNS and MNP products was previously tested and
51 generally found to be high in Pakistan (11), Ghana (12), Burkina Faso (13, 14), and Malawi
52 (15). However, studies in refugee contexts have indicated that MNP is not always well
53 accepted and that adherence can be low (16). When introducing any nutrition or health
54 intervention, including within refugee contexts, the issues of acceptability and adherence in
55 the local context should be key considerations (17).

56 Therefore, prior to the initiation of a blanket supplementary feeding programme to
57 reduce anaemia and stunting within the refugee camps in Algeria, a field-based study was
58 designed and conducted. The objectives of the study were to assess the acceptability of an
59 LNS (Nutributter®) in children 6-35 months old, and a MNP in children 36-59 months old
60 and pregnant and lactating women; to determine adherence to the recommended doses after

61 15 days of use; and to investigate appropriate information messages and distribution
62 mechanisms.

63

64 **Methods**

65

66 *Study location*

67 The LNS acceptability test was implemented in 2009 in four Saharawi **refugee camps in south**
68 **west Algeria**; namely Smara, Laayoune, Awserd, and Dakhla. The MNP acceptability test was
69 only implemented in Smara camp. **The camps lie close to the city of Tindouf and are**
70 **characterized by a harsh desert environment where sand storms are frequent, with extremely**
71 **high temperature throughout the months of May to September (reaching above 50° C), and a**
72 **cold winter season from November to March. Rainfall is scarce and irregular. The refugee**
73 **population originated from Western Sahara and are predominantly Sunni Muslim. Refugee**
74 **houses are made of local building materials, and complemented with tents. The tents are**
75 **regarded as suitable for the extreme weather and provide relatively cool accommodation**
76 **during the hot season.(18)**

77

78 *Product formulation*

79 Because excessive iodine intake is a problem among Saharawi refugees (1, 19, 20), the
80 Nutributter® formulation was adjusted by removing iodine from the fortificant premix (Table
81 1). However, it was not feasible to alter the MNP formulation at the time of the study and
82 hence the MNP was only used in the camp where iodine intakes are acceptable due to the
83 presence of a reverse osmosis plant that demineralises household drinking water, thereby
84 decreasing overall iodine intake.

85

86 *Ethical approval*

87 The Saharawi Ministry of Health approved the implementation of the study and stated that
88 formal ethical approval need not be sought. An authorization letter to conduct the assessment
89 was signed by the Ministry of Health prior to the start of the assessment. This study was
90 conducted according to the guidelines laid down in the Declaration of Helsinki. All potential
91 participants received information about the assessment before enrolment. Those wishing to
92 participate signed an informed consent form, indicating the voluntary nature of the test and
93 their right to discontinue follow-up at any point.

94

95 *Study design and participants*

96 The study included two main components: a quantitative measurement of acceptability and
97 adherence that involved conducting interviews with participants at household level; and a
98 qualitative component **that involved focus group discussions (FGD)**.

99 Three population groups were selected for the quantitative measurements,
100 corresponding to the target groups that were planned for the subsequent supplementary
101 feeding programme. Children aged 6-35 months were given LNS while children aged 36-59
102 months and pregnant and lactating women were given MNP. These target groups were
103 recommended by the UNHCR-WFP Joint Assessment Mission conducted in 2009 in the
104 camps (18). The growth monitoring programme for children aged 6-59 months running in the
105 camps was split in two groups: children 6-35 months and 36-59 months. Hence, the target age
106 group for the LNS, which is usually 6-23 months, was expanded to include children up until
107 age 35 months to ensure the feasibility of incorporating product distributions into ongoing
108 programmes.

109 The sample size needed to assess acceptability and adherence to both products at the
110 household level was calculated using an expected proportion of 50% adherence, 5% error
111 risk, 10% precision, and an expected 20% loss to follow up. **The sample size was calculated**
112 **using ENA for SMART software (version October 2007) and was 114 for each group.**

113 At the beginning of the study, key meetings at various levels were arranged with the
114 health authorities, health staff, parents, and pregnant and lactating women in all camps. The
115 objectives of these meetings were to inform them about the nutrition products and the planned
116 test, and seek their full cooperation and participation.

117 Purposive sampling was used to select the participants. Eligible participants were
118 identified through the growth monitoring programme or the antenatal care clinics from the
119 registers in the health centres. To ensure participants were equally distributed throughout the
120 camps, the same number of participants was selected from each health centre. Children
121 meeting the age criteria whose parents showed an initial interest in the test, and pregnant and
122 lactating women were invited for a preliminary screening. Those who met all eligibility
123 criteria and gave their consent to participate were enrolled. **The age** of the children was
124 confirmed using their health card.

125 **For the MNP group, children aged 36-59 months were recruited in August 2009 based**
126 **on the following inclusion criteria: enrolled in the camp's growth monitoring programme, and**
127 **available to participate during the entire study period. Pregnant and lactating women were**
128 **selected in August 2009 based on the following inclusion criteria: enrolled in the camp's**
129 **antenatal care clinic and available during the study period. Children aged 36-59 months were**
130 **excluded if they had a severe systemic illness warranting hospital referral, had a weight-for-**

131 height z-score below or equal to -2 according to WHO 2006 Growth Standards, were
132 receiving therapeutic care for anaemia or were involved in another study. Pregnant and
133 lactating women were excluded if they had a severe systemic illness warranting hospital
134 referral, were receiving therapeutic care for anaemia or were involved in another study.

135 For the LNS group, children aged 6-35 months were recruited in September 2009. The
136 recruitment of subjects and distribution of LNS occurred later than for MNP due to a delay in
137 customs clearance during importation of the product. Recruitment was based on the following
138 inclusion criteria: enrolled in the camp's growth monitoring programme, eating
139 complementary foods in addition to breast milk (at least one meal a day), and available to
140 participate during the entire study period. Children aged 6-35 months were excluded if they
141 had a severe systemic illness warranting hospital referral, had a history of allergy towards
142 peanuts, had a history of anaphylaxis or serious allergic reaction to any substance requiring
143 emergency medical care, were enrolled in the camp's therapeutic or supplementary feeding
144 programmes for acute malnutrition, had a weight-for-height z-score below or equal to -2
145 according to WHO 2006 Growth Standards, were receiving therapeutic care for anaemia, had
146 congenital defects such as cleft palate or any illness likely to interfere with food intake, or
147 were involved in another study.

148 For FGDs, a sub-sample of participants was conveniently selected from specific
149 groups of interest to investigate issues around acceptability and use of the products. To inform
150 the content of the FGD guides, KI interviews were conducted with members of the health
151 authorities, community leaders, religious leaders, traditional medicine healers, and health
152 staff. Respondents were conveniently sampled and four KI interviews were carried out with
153 the health authorities, two with the community leaders in Smara and in Dakhla, six with the
154 health staff from Smara, Dakhla and Laayoune, one with a religious leader in Smara, and one
155 with a traditional medicine healer in Awserd. Data collection for the MNP group took place
156 from the 29th of July to the 11th of September and for the Nutributter® group from the 12th of
157 September to the 15th of October, 2009.

158

159 ***Procedures***

160 The Saharawi Ministry of Health selected the health staff teams for data collection. A
161 total of 52 health staff were trained in the four camps. Teams were trained on how to prepare
162 complementary foods with MNP, the correct use of LNS, dosages and administration. Other
163 issues covered in the training included an explanation of the teams' tasks and responsibilities,
164 and procedures for monitoring, quality control, household visits and follow-up visits. Each

165 health staff was provided with a flip chart containing nutritional information on how to use
166 LNS and MNP.

167 Twenty six teams were created to conduct the household interviews and were
168 organized by camp and supervised by two sets of field supervisors: 13 teams worked in Smara
169 and Awserd, and 13 teams covered the Dakhla and Laayoune camps. Each team was
170 composed of two people from the clinic, i.e. the head of the clinic (nurse) and an auxiliary
171 health staff. Teams conducted the household visits during the meal time (lunch or dinner) in
172 order to carry out the interviews and perform direct **observations of how** the products were
173 stored in the household. Information on household location and composition was recorded,
174 but it was not deemed necessary or useful to collect lengthy socio-demographic information
175 on the participants due to the relative homogeneity of the camp population.

176 Initial nutrition education sessions on how to use the LNS and the MNP were given by
177 health staff to women participants in small groups (five to ten persons) in the clinics of two
178 camps (Smara and Dakhla) and at the individual level in the other two camps (Laayoune, and
179 Awserd). Instructions on how to use the nutrition products and the dosage were the main
180 focus of the session. **Education material was specifically developed for this purpose with key**
181 **instructions and messages on the different products.** All participants, or their caregivers, were
182 instructed to take the nutrition product daily for four weeks, and were asked to keep the empty
183 sachets so they could be counted. The recommended schedule of use for all the participants
184 was one sachet per day, i.e. a 20 g sachet of LNS or a 1 g sachet of MNP. A total of 30 LNS
185 or 30 MNP sachets were distributed to the caregivers and to the pregnant and lactating women
186 **by the study staff** at the beginning of the test in plastic bags, **either at the clinic or in their**
187 **homes.**

188 Household interviews were conducted at baseline, and acceptability, consumption, and
189 adherence were assessed through household visits at mid-point (15 days) and at the end of the
190 test (30 days), during which **interviews on acceptability** were conducted and empty sachets
191 were counted. The number of lost or discarded empty sachets and shared sachets were also
192 assessed by interview. Consumption was classified using the percentage of sachets consumed
193 over the dose recommended for the defined period of time: “very low” (<25%), “low” (25-
194 <75%), “optimal” (75-125%) or “excessive” (>125%). Individual adherence was defined
195 using the mid-point consumption measurement as: “Poor” if consumption was very low or
196 excessive; “Moderate” if consumption was low; or “Good” if consumption was optimal.
197 Population adherence was considered adequate if >70% of participants displayed Good or
198 Moderate **adherence. A product was considered acceptable if $\geq 75\%$ subjects reported liking it**
199 **at the end of the test period and $\leq 20\%$ would prefer to stop taking it.**

200 Focus Group Discussions were conducted in convenient locations in the different
201 camps, such as health centres or community buildings, which participants were invited to
202 attend. Groups were facilitated by the field researcher (a female, Spanish, nutritionist) assisted
203 by a local interpreter. The major themes covered in the FGDs were as follows: household
204 eating habits; superstitions related to food; likeability of the products; sharing of products;
205 food preparation; effects on food; adverse effects; perceived benefits; perceptions of the
206 products; products distribution; and barriers to use. Findings were recorded by the field
207 researcher using manual note taking during the interviews.

208 Initial statistical analysis of quantitative data was done using Epi Info software
209 (version 3.5). Graphing and statistical testing of sachet consumption (Kruskal-Wallis rank
210 test) was carried out in Stata I/C version 12.1 (21). Significance was assigned when $p < 0.05$.
211 Qualitative data from focus group discussions were analysed manually by topic to identify the
212 main emergent themes, consistencies, differences, and relationships. Findings were recorded
213 and compiled in an Excel spreadsheet.

214

215

216 **Results**

217

218 *Sample characteristics*

219 Table 2 shows the characteristics of the sample selected for the quantitative household
220 interviews. A total of 123 children aged 6-35 months were recruited at baseline and given
221 LNS. The LNS results are presented for all four camps combined, as similar results were
222 found in each camp. For the MNP group a total of 112 children, aged 36 to 59 months, and
223 119 pregnant and lactating women were recruited from 206 households in Smara camp at
224 baseline. Average household size was 6.0 in Smara with 2.3 children under-5. In the other
225 camps, the average number of children under-5 was also 2.3. In the LNS group, there was one
226 loss to follow-up. In the MNP group, there were two losses to follow-up for children and one
227 for pregnant or lactating women. Some of the household interview questionnaires had a high
228 percentage of missing data, ranging from 11% of the questionnaire in the LNS group, and up
229 to 34% of the questionnaire in the MNP group. For children, the respondents were the
230 mothers in 88.6% of the cases in the LNS group and 96.2% of the cases in the MNP group. In
231 the other cases, the respondent was another member of the household.

232

233 *Acceptability*

234 Acceptability was assessed both quantitatively and qualitatively (see below). Differences in
235 measures of acceptability were compared statistically at the end point of the study. As shown
236 in Table 3, there was a significant difference between all 3 product groups in the proportion of
237 participants reporting that they liked the product, with 98.4% liking LNS compared to 90.4%
238 of women consuming MNP and 75.5% of children using MNP ($p<0.05$). There were no
239 significant differences in other measures of acceptability with $> 90\%$ of participants in all
240 groups finding the products easy to use and $<10\%$ reporting that they would prefer to stop
241 using the product or that they shared sachets during the test.

242

243 *Consumption and adherence*

244 Consumption was measured by counting empty sachets and was assessed at mid-point (after
245 15 days of use) and **endline** (after 30 days of use); results are summarized in Table 4. It was
246 found that median sachet consumption by children receiving the LNS was 15 and 30 sachets
247 by the mid-point and end visits, respectively. Children receiving MNP consumed 13 and 23
248 sachets, and pregnant and lactating women consumed 11 and 25 sachets at mid-point and
249 **endline**, respectively. As shown in table 4, consumption of LNS was higher than consumption
250 of MNP by either children or pregnant and lactating women at both time points ($p<0.001$). No

251 differences in consumption of MNP were seen between children and pregnant and lactating
252 women. It was found that 61.9% (75/121) of the children receiving the LNS consumed all 30
253 sachets whereas only 13.0% (14/108) of the children and 12.1% (13/107) of the pregnant and
254 lactating women receiving MNP consumed all 30 sachets. “Good” adherence at the mid-point
255 of the test was observed in more children receiving the LNS, 89.1% compared to 65.8% and
256 57.0% of children and pregnant and lactating women receiving MNP ($p < 0.001$).

257 Figure 1 illustrates the distribution of percentage consumption for the two different
258 products after 15 days. The median level of consumption with LNS lies close to 100% and
259 has a relatively narrow interquartile range, although there are a number of outliers. The
260 consumption of 7/110 participants receiving the LNS was over 150% of the recommended
261 dose. Consumption of daily doses of MNP was lower in both children and pregnant and
262 lactating women and “excessive” consumption was not found in any of these groups.

263 Questions were asked about whether any empty sachets were lost or thrown away and
264 if any sachets were shared. The empty sachets lost or thrown away were classified as not
265 having been consumed for the adherence analysis presented in Table 4. The percentage of
266 participants reporting losing or throwing away empty sachets increased for both nutrition
267 products from the mid-point to the end of the test. In the LNS group, 7.9% (9/114) and 20.8%
268 (25/120) of caregivers reported having lost or thrown away empty sachets at mid-line and
269 end, respectively. In the child MNP group, 34.1% (28/82) and 45.4% (49/108) of caregivers
270 reported having lost or thrown away empty sachets at mid-line and end, respectively. Finally,
271 in the women MNP group, 20.9% (18/86) and 42.1% (45/107) of respondents said they had
272 lost or thrown empty sachets at mid-line and end, respectively. Overall, there was a higher
273 percentage of participants reporting losing or throwing out empty sachets in the MNP groups
274 compared to the LNS group. A similar proportion of caregivers (<10%) giving LNS or MNP
275 to their child reported sharing the products with people other than the targeted children (Table
276 3). However, a very small percentage of pregnant and lactating women reported sharing MNP
277 sachets (<2%) at the end of the test.

278 Caregivers and women were given information on the importance of keeping the
279 products in a cool and dry place, and inside a small bag. Direct observations in the home by
280 the study teams revealed the majority of participants stored the product as recommended, for
281 example, in the pantry, wardrobe, or in the bedroom.

282

283 ***Qualitative findings on product acceptability***

284 Information on the perceptions and preferences of participants and the community was
285 gathered through focus group discussions. A list of the groups that were conducted is
286 presented in table 5 and a summary of the main findings is provided in Table 6.

287 The organisation of the mealtime within the household was found to be quite similar in
288 all of the four camps. Two superstitions about the foods were identified that might have
289 affected product acceptability and adherence. However, a direct relationship between these
290 beliefs and product acceptability was not described. Regarding the acceptability of the
291 nutritional products, some of the general comments made included: “*We like it because it is*
292 *good for our children’s health and for ourselves*”. Two different types of reaction were
293 reported by caregivers regarding sharing. Some caregivers explained to the older children that
294 the product was like a “medicine” for his or her brother or sister and it was not possible to
295 share it, while other caregivers were happy to share the sachets with the siblings. A few
296 people who reported a change in colour of the food when mixed with MNP reported that,
297 “*The colour of the food changed to yellowish*”. In addition, some mothers mentioned that the
298 smell of the MNP was similar to iron. Several adverse side effects were reported to occur by
299 participants, but none were confirmed by health staff. The occurrence of all adverse effects
300 was found to be low except for changes in stool colour that were reported by many caregivers
301 or family members taking care of the enrolled child. There were several perceived benefits
302 reported for children and pregnant and lactating women. Some community members who
303 were reluctant to accept the products highlighted that the solution to the nutritional problems
304 should be addressed by providing a better general food distribution through a more diversified
305 diet and to avoid using them as an “*experimental laboratory*”. Even so, these more reluctant
306 minorities did not refuse to try the new products, and to support its acceptability. In addition,
307 some women believed the best food for them and their children to prevent malnutrition are
308 natural products, the ones “*inside the cooking pot and should be cooked*”. However, it was
309 noted that a product that is introduced by health staff through the Ministry of Health, followed
310 by a sensitization programme, is more likely to be accepted by the population. Clinics were
311 identified as the best locations for product distribution. A long term distribution of nutrition
312 products to children from 6 months to 59 months of age was not seen as a problem. The
313 women interviewed mentioned that in the kitchen, they are completely free to prepare what
314 they think is necessary and convenient for their children. However, in Saharawi families,
315 elderly people play a very important role, and their opinion is considered as a reference and is
316 always taken into account in decision making. It was stated that grandmothers can especially
317 influence the behaviour of women (young mothers and pregnant and lactating women).

318 Husbands and men also play an important influential role in the community. Both these
319 groups might therefore potentially influence decisions on product use.

320

321 *Naming and packaging of the products*

322 The focus group discussion participants were asked to provide their opinion on
323 potential names and packaging for the products based on their experience of using or seeing
324 the generic packages of both products. The name proposed by health staff for the LNS was
325 “Gazela” (غزالة), meaning gazelle and metaphorically representing vitality, agility and beauty.
326 The name proposed for the MNP was “Chaila” (شائلة), which is a female camel that provides
327 milk, and is considered as a symbol of healing of any disease. There is a belief among the
328 Saharawi population that when someone is ill, the person should go with a female camel to
329 the desert during 40 days and take her milk to recover. It was suggested that the name and
330 wording on the packaging for both products should be written in the Arab (Hassaniya)
331 language. It was mentioned that to avoid the risk of superstition or rumours about either
332 products, the composition of the product, including a specification that it did not contain pork,
333 should be written on the package. Colours were also proposed for the packaging and this
334 information was used by an artist who was subsequently asked to design the package.

335

336 **Discussion and recommendations**

337

338 This paper describes a simple and rapid method for determining the acceptability,
339 consumption, and adherence to novel nutritional products. This is the first report of an
340 adherence study conducted within a refugee emergency nutrition programme and it proposes
341 thresholds for defining adequate acceptability and adherence for similar products in these
342 contexts. Unlike other recently reported adherence studies (12, 13, 22), the method is
343 designed to allow the measurement of both under and over-consumption during feeding at
344 home and calculates adherence taking both of these behaviours in to account. When assessing
345 the use of highly fortified products, such as those we tested, the ability to measure over-
346 consumption is particularly important. The method is most easily applied when the products
347 are supplied in sachets or packets but can be adapted to measure consumption and adherence
348 to products supplied in other formats.

349 Results indicated that both LNS and the MNP were acceptable to the Saharawi
350 refugees in the camps in Algeria, according to these pre-defined criteria. While it should be
351 noted that the products were tested on different age groups, there were significant differences
352 in the acceptability and adherence to the products, with LNS performing better than MNP.

353 Overall, the local population was very aware of the nutrition problems that children and
354 pregnant and lactating women face, such as anaemia and chronic malnutrition, and was
355 willing to cooperate in finding solutions. The fact that several years ago (1999) a similar high
356 nutrient density spread product had been trialled and well received may have favoured a
357 positive reaction from the community (2). However, we also found a small proportion of the
358 community who would rather see the nutritional problems being addressed without the use of
359 special nutrition products.

360 Similarly to the results from our study, other studies have found Nutributter® and
361 MNP to be acceptable to children and caregivers (13, 23-26). It is important to recognise that
362 the acceptability test described here differs from some other, more detailed, acceptability
363 trials. Such trials usually involve testing the acceptability of various products in comparison
364 to one another with a target group of potential consumers or patients. They frequently follow
365 the format of a randomized, controlled, cross-over trial design where food intake, flavour,
366 appearance, colour, aroma preference, overall degree of liking and side effects are studied.
367 The assessment described here was not intended for comparing the acceptability of different
368 products, but rather to determine if the products were acceptable in comparison to pre-
369 determined adequacy criteria.

370 Acceptability and consumption was measured by household level interviews and
371 counting empty sachets over a 30 day period. While changes in acceptability and consumption
372 may occur during subsequent time periods, the choice of 30 days was considered an
373 appropriate compromise between the need to allow participants to settle into an established
374 behaviour and the necessity of conducting a rapid assessment within an emergency feeding
375 programme.

376 Sachet counting revealed that 'good' adherence was higher in participants consuming
377 LNS compared to MNP. However, there were a number of outliers with high consumption,
378 raising concerns about the possibility of over consumption in some young children. A recent
379 study in Burkina Faso has indicated that estimates of LNS consumption may vary according
380 to the methods used, with direct observation during a 12 hour period producing lower
381 estimates than overall sachet counting.(14) Despite sachet counting being an indirect method
382 of measuring consumption, it was the most feasible to do in this context as it was not possible
383 for the health workers to undertake direct observation due to time constraints. It also has the
384 advantage of reducing possible bias due to the observer effect. For the calculation of
385 consumption it was assumed that the entire contents of the empty sachet had been added to
386 food and fed to the child or eaten by the pregnant and lactating woman, and that the food was
387 not shared with any other family member throughout the entire intervention.

388 According to the results of the acceptability questionnaire some sharing did take place,
389 although it was reported by less than 10% of participants for all products and time points. In
390 addition, some empty sachets were reported to be lost or thrown away and these were
391 assumed not to have been consumed, and therefore adherence might be underestimated. Many
392 participants mentioned a change in stool colour during the consumption test but it did not
393 seem to be a major problem for them as they had been informed in advance that this could
394 happen.

395 The following recommendations for programme planning and implementation were
396 made based on the results. Concerning the MNP intervention, even though the daily regimen
397 was reported to be acceptable by the participants (for use in both children and in pregnant and
398 lactating women), “Good” adherence was relatively low. Therefore, in an attempt to improve
399 adherence, a flexible approach (i.e. one sachet every other day) was recommended for
400 programme implementation, instead of a daily regimen. Concerning the usage of the LNS,
401 according to the data collected, caregivers were highly adherent to the daily regimen.
402 However, because the LNS had not been used for periods longer than six months in young
403 children in any published trial, and the programme was planned to last for much longer in the
404 Algeria camps, a flexible approach (i.e. one sachet every other day) was also recommended,
405 with the view of reducing the quantities consumed over prolonged periods. It was
406 recommended that issues regarding the potential for over consumption of the product due to
407 its pleasant taste, possible displacement of breastfeeding (especially in age groups 6-12
408 months), and possible threats to dental health (high sugar content of the product) were to be
409 communicated to the caregivers as part of the key messages communicated to programme
410 participants. It was also recommended that the micronutrient formulation of both the LNS and
411 MNP should not contain iodine due to published data and local concerns on excessive intakes
412 in this population (19, 27).

413 When new nutrition products are introduced in the Ministry of Health programmes in
414 the present refugee context, key staff from the health centres should be sensitized and
415 involved in the whole process from planning to implementation. In addition, experience has
416 shown that a sensitization campaign should be set up at the beginning of any new programme.
417 It was recommended to do regular education sessions with the Ministry of Health
418 involvement via posters, television or radio. These would explain how to use the different
419 nutrition products focusing on the mothers and the grandmothers, what the benefits of the
420 products are, what the potential side effects are and how to manage them, and information
421 provided to discourage people from sharing. The interventions were recommended to be
422 implemented using a phased-in approach, starting first with some selected sections of the

423 camps in order to develop lessons learnt, rather than launching the programme at full scale
424 from the beginning. Household visits were recommended to be organized in order to monitor
425 the interventions following a specific sampling procedure.

426 A major limitation of the present study is the large number of missing data from the
427 household interviews, especially in the MNP group, mainly due to forgetfulness of the data
428 collection teams. This was the first acceptability test conducted using this newly developed
429 protocol in a refugee context and, **with the benefit of hindsight, a higher level of team**
430 **supervision from the outset would have been useful.** Additionally, half of the acceptability
431 test was conducted during Ramadan when staff can tire **more** easily during the day. **Ramadan**
432 **may have also influenced adherence negatively for the MNP group.** One team was chosen
433 from each clinic (26 teams in total), which was perceived to be very positive because the
434 health staff was involved from the beginning of the test, however, having such a large number
435 of teams made supervision more challenging. Because the LNS test was conducted following
436 the MNP test, **the lessons learnt regarding data completeness** during the MNP test were taken
437 into account for the LNS test. For the latter, **supervision was strengthened thereby decreasing**
438 **considerably the amount of missing data in the LNS group compared to the MNP group.**
439 Purposive sampling was used to recruit participants and this may have introduced some bias
440 into the assessment results, as willingness to participate may be associated with a higher
441 probability of adherence to the intervention.

442 This acceptability and adherence test was the first field study of this type to be carried
443 out by UNHCR as part of their global strategy aimed at reducing anaemia and chronic
444 malnutrition. After the experience gained during **this assessment**, UNHCR carried out
445 additional acceptability tests in different settings, including Djibouti in November 2009 and
446 Yemen in November 2010. Subsequently, Operational Guidance was published in 2011
447 containing a field-friendly, generic acceptability test protocol that was designed to be adapted
448 to each setting (28). The LNS and MNP blanket programmes started in the camps in Algeria
449 in December 2010 using some of the recommendations described here, and the impact results
450 on anaemia and nutritional status in children aged 6-59 months from the routine cross-
451 sectional surveys and programme monitoring data will be analysed and published in the
452 future.

453

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- 543

Tables

Table 1. Nutrient composition of the nutrition products

Nutrient	Nutributter®/20g	MNP/sachet
Vitamin A (mg)	0.4	0.4
Vitamin D (µg)	-	5
Vitamin E (mg)	-	5
Vitamin K (µg)	-	30
Vitamin C (mg)	30	60
Thiamine (mg)	0.3	0.5
Riboflavin (mg)	0.4	0.5
Niacin (mg)	4	6
Vitamin B ₆ (mg)	0.3	0.5
Vitamin B ₁₂ (µg)	0.5	0.9
Folic acid (µg)	80	150
Iron (mg)	9	10
Zinc (mg)	4	4.1
Copper (mg)	0.2	0.34
Selenium (µg)	10	17
Iodine (µg)	-	90

Table 1. (CONT)

Nutrient	Nutributter®/20g	MNP/sachet
Calcium (mg)	100	-
Phosphorus (mg)	82.1	-
Potassium (mg)	152	-
Magnesium (mg)	16	-
Manganese (mg)	0.08	-
Pantothenic acid (mg)	1.8	-
Total energy (kcal)	108	-
Proteins (g)	2.6	-
Fats (g)	7.1	-
Linoleic acid (g)	1.29	-
α -Linolenic acid (g)	0.29	-

Table 2. Characteristics of quantitative study sample

Population group	Location	Participants (n)	Nutrition product
Children 6-35 months	Smara	28	LNS
	Laayoune	30	
	Awserd	30	
	Dakhla	35	
Total		123	
Children 36-59 months	Smara	112	MNP
	Total	112	
Pregnant and lactating women	Smara	55 (pregnant)	MNP
	Smara	64 (lactating)	
Total		119	

For Peer Review

Table 3. Acceptability and use of products at the mid-point and end of the 30-day assessment

	LNS-children 6-35 months		MNP-children 36-59 months		MNP-pregnant and lactating women	
	Mid-point	End	Mid-point	End	Mid-point	End
Participants who liked the nutrition product	115/122 (94.3)	120/122* (98.4)	80/98 (81.6)	80/106** (75.5)	93/102 (91.2)	94/104*** (90.4)
Participants reporting that the product was easy to use	116/121 (95.9)	115/121 (95.0)	81/89 (91.0)	83/91 (91.2)	77/87 (88.5)	104/109 (95.4)
Participants who would prefer to stop taking the product	3/120 (2.5)	7/122 (5.7)	11/102 (10.8)	9/107 (8.4)	8/95 (8.4)	11/111 (9.9)
Participants who shared sachets during the test	10/122 (8.2)	8/120 (6.7)	9/98 (9.2)	5/106 (4.7)	-	2/104 (1.9)

LNS, lipid-based nutrient supplement; MNP, micronutrient powder

Values in parentheses are percentages.

*indicates a different response compared to other product groups at end-point ($p < 0.05$)

Data on sharing was not collected for PLW at mid-point

Table 4. Product consumption and adherence at the mid-point of the study

	LNS Children 6-35 months		MNP Children 36-59 months		MNP Pregnant and lactating women	
	Mid-point	End	Mid-point	End	Mid-point	End
n	110	121	76	108	79	107
Median sachet consumption (IQR)	15* (14-15)	30 [†] (28-30)	13 (9-15)	23 (18-28)	11 (9-15)	25 (15-28)
Adherence categories, n (%)						
Poor	9 (8.2)		3 (3.9)		3 (3.8)	
Moderate	3 [^] (2.7)		23 (30.3)		31 (39.2)	
Good	98 [^] (89.1)		50 (65.8)		45 (57.0)	

LNS, lipid-based nutrient supplement; MNP, micronutrient powder; Adherence categories were defined using the % of actual consumption compared to the recommended dose. Poor, <25% or >125%; Moderate, 25% to <75%; Good, 75% to 125%.

* Sachet consumption higher at mid-point compared to other groups at the same time point (p<0.001)

[†] Sachet consumption higher at end-point compared to other groups at the same time point (p<0.001)

[^] Adherence differs compared to other groups (p<0.001)

Figure 1 Percentage of the recommended dose consumed by participants after 15 days

Footnote: Adherence categories are indicated by dotted lines and the labels on panel (a)

Poor, <25% or >125%; Moderate, 25% to <75%; Good, 75% to 125%.

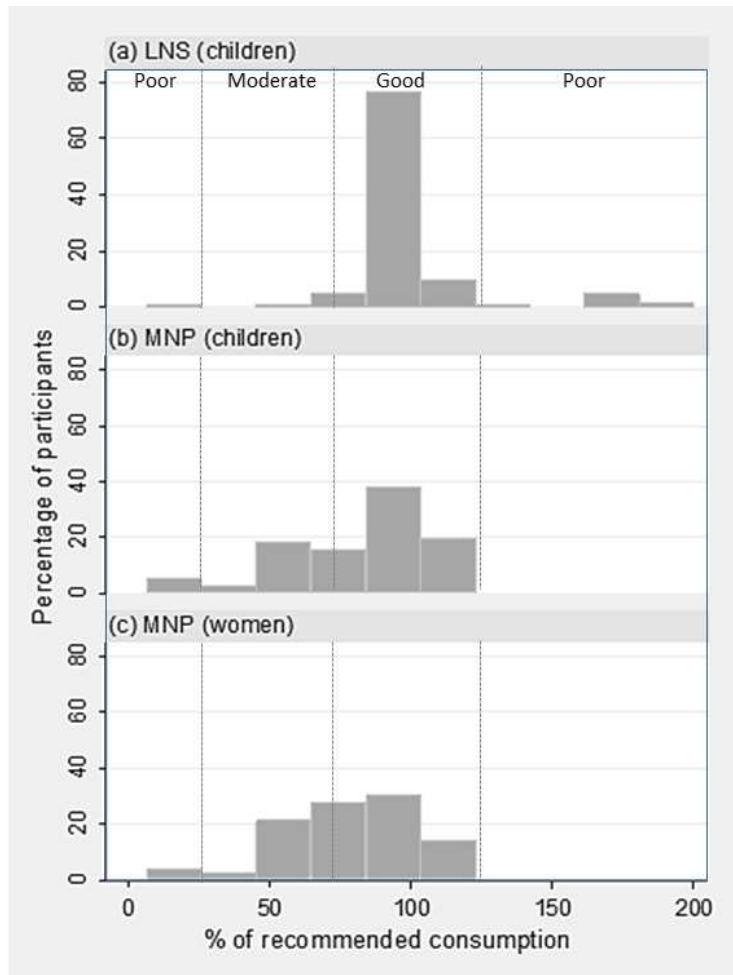


Table 5. Location, product focus, and participants of focus group discussions on acceptability

Time-point and product focus	Health staff	Caregivers and pregnant and lactating women	Men	Grand-mothers
Baseline MNP groups	Smara (15)	Smara (11)		Smara (4)
Baseline LNS groups	Smara (15) Laayoune (13) Dakhla (15) Awserd (13)	Dakhla (7)		Smara (4)
Endline MNP groups	Smara (15)	Smara (12)	Smara (5)	
Endline LNS groups	Awserd (13)	Laayoune (5) Smara (5)		Dakhla (3)

Values in parentheses indicate number of participants in a single focus group discussion

Table 6. Key focus group findings by theme

Household eating habits	Men, and women and children usually eat separately.
Superstitions related to food	There is an excess of salt in the food. Burnt food might cause a disease called ‘Guindi’, an intoxication with symptoms including headaches and gastrointestinal symptoms.
Likeability of the products	Mothers generally liked the appearance of the products and were quite motivated to give them to their children.
Sharing of products	Siblings of enrolled children felt jealous and wanted to steal the food that had been mixed with the products. This appeared to be more frequent for children receiving LNS, compared to MNP.
Food preparation	The MNP was most commonly mixed with lentils, rice, porridge, potato, or carrots. The LNS was eaten directly from the sachet for the majority of children. When mixed with foods, the LNS was spread on bread during breakfast or eaten with rice.
Effects on food	Most reported no effect on the color, taste, or appearance of food when adding the products.
Adverse effects	Adverse side effects reported included diarrhea, change in stool color, constipation, nausea, vomiting, and abdominal pain.
Perceived benefits	Caregivers observed that the children were more talkative and playful after eating the products. Pregnant and lactating women mentioned their fatigue decreased. An increase in appetite was mentioned by all groups.
Perceptions of the products	The majority of the community members appeared to accept both products well, with a few showing some concerns.
Nutrition products distribution	Clinics were identified as the best locations for product distribution.
Barriers to use (community and family members)	The families of enrolled participants and the community members identified no barriers to product use.

Figure 1 Percentage of the recommended dose consumed by participants after 15 days
Footnote: Adherence categories are indicated by dotted lines and the labels on panel (a)
Poor, <25% or >125%; Moderate, 25% to <75%; Good, 75% to 125%.

