Educational activities for the prevention of neural tube defects using folic acid supplementation through public-private partnerships in Japan

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Abstract:
Objectives: Neural tube defects (NTDs) are major congenital anomalies. To establish new and effective strategies to prevent these defects, public-private partnerships (PPPs) were formed between a healthcare company in Japan and numerous local governments to create educational activities regarding the importance of folic acid supplementation.

Methods: Projects for promoting maternal and child health using healthcare products and services created by a healthcare company were proposed to local governments as PPPs.

Results: Nine municipalities distributed folic acid supplements together with a Mother and Child Handbook while seven municipalities conducted surveys to identify people’s knowledge and behavior toward folic acid use.

Conclusions: Recent studies have shown that periconceptional folic acid use improves many pregnancy outcomes; therefore, establishing educational activities regarding the importance of folic acid supplementation through PPPs is a rational and effective measure to promote maternal and child health.

Keywords: folic acid, neural tube defects, public-private partnerships, maternal health, supplementation

1. Introduction

Neural tube defects (NTDs) are major congenital anomalies of the central nervous system that have both genetic and non-genetic etiologies. Folic acid (FA), or folate, is a type of vitamin B. Worldwide, the recommended daily intake of folic acid/folate is 0.4 mg (400 μg); however, the recommended daily intake is only 240 μg in Japan. For pregnant women, a daily folate intake of 400 μg is recommended [1–3].

FA is needed for DNA synthesis and is essential for the healthy development of a fetus. Although the exact mechanisms underlying NTDs remain unclear, nutritional or genetic defects in the homocysteine-methionine cycle, which is catalyzed by methionine synthase, are likely to be involved. The rapidly dividing cells of the neural tube are particularly sensitive to deficiencies in FA because of the importance of folate in the biosynthesis of nucleic and amino acids, specifically in the metabolism of methyl groups. Mandatory fortification of food with folic acid has proven to be highly effective in decreasing the incidence of NTDs; while this program has been expanded globally, Japan does not yet have such a policy. In the year 2000, the Japanese government recommended that women who have the potential to be pregnant take 400 μg FA supplements daily starting from 1 month before pregnancy to up to 3 months of gestation [4]. However, despite this recommendation, the prevalence of NTDs in Japan has not declined [5,6].

To reduce the incidence of NTDs, the Japanese Teratology Society released a message stating that women who are planning to get pregnant should consume 400 μg of FA daily as a dietary supplement [7].
Local governments face challenges in conducting health promotion policies because of their limited resources. Public-private partnerships (PPPs) have been considered as possible methods to attract additional resources. Furthermore, private companies can incorporate their corporate social responsibility efforts into creating shared value to establish successful PPPs.

2. Purpose

To establish new and effective strategies to prevent NTDs through FA supplementation, programs to educate the public on the importance of FA supplementation were conducted as PPPs in Japan.

3. Materials and methods

Projects for health promotion using healthcare products and services were created by DHC Corporation, a healthcare company, and proposed to local governments as PPPs. As of July 2020, DHC Corporation has concluded the comprehensive partnership agreement with 21 Japanese local governments (13 cities and 8 towns); four other cities have also signed agreements on health promotion.

Based on these agreements, the proposed strategies for health promotion and disease prevention were as follows: 1) the establishment of educational programs that highlight the importance of FA supplementation during pregnancy, and 2) distribution of FA supplements.

The suggested activities included the following:

i) Flyers/brochures containing information on folate and FA supplementation
   Flyers/brochures were provided to inform pregnant women of the clinical importance of folate/FA intake before and during pregnancy for maternal and child health.

ii) Samples of dietary supplements
   A 30-day supply of FA dietary supplements was provided as a sample; each tablet contained 400 μg of FA, 1.3 mg of vitamin B12, 1.7 mg of vitamin B6, and 2.5 μg of vitamin B12 as active ingredients.

iii) Toll-free telephone services
   Toll-free telephone services were provided to connect pregnant women with medical professionals so that pregnant women could receive answers to dietary supplement-related questions.

iv) Questionnaires regarding folate/FA
   Questionnaires regarding an individual’s knowledge on FA supplements and their use were provided.

4. Results

Nine local government units executed the proposed educational programs and distributed FA supplements together with Mother and Child Handbooks; the cities/towns that participated were Naganuma, Hokkaido; Ninohe, Iwate; Matsuda, Kanagawa; Ito, Shizuoka; Nankoku, Kochi; Sukumo, Kochi; Miyaki, Saga; Nagasu, Kumamoto; and Nagashima, Kagoshima.

Of the nine participating municipalities, seven conducted surveys to determine the level of knowledge about FA among pregnant women; nine hundred pregnant women answered these questionnaires between April 1, 2018 and March 31, 2019.

Table 1 shows the results of the survey on the knowledge, perception, and behaviors of participants regarding folate/FA. Of the 900 participants, 94.2% knew what folate/FA is, while 58.3% knew which foods contain folate/FA. Meanwhile, 75.0% of participants claimed that they knew that sufficient intake of FA before pregnancy could prevent NTDs. Regarding absorption, 60.3% of participants said they did not know whether there are differences in the absorption rate of folate in food versus folate in dietary supplements. In total, 57.9% of participants answered that they used dietary supplements as a source of FA. Finally, 96% of participants considered that it was a good strategy for local governments to distribute FA supplements to support pregnant women.

5. Discussion

Although having a balanced diet is important for everyone, women who are planning to get pregnant or those who might be pregnant are advised to take additional vitamin supplements, including FA supplements. FA is a B-vitamin and is found in various foods such as leafy green vegetables, orange juice, and strawberries. However, these foods alone may not contain enough folate to cover the universally recommended daily intake of 400 μg since the amount of folate available for absorption can be reduced during cooking.

It has been well-established that sufficient intake of folate/FA during the periconceptional period (prior to conception and during early pregnancy or before 12 weeks of gestation) reduces the occurrence of NTDs and other birth defects [8,9]. Currently, the National Institute of Clinical Excellence in the UK recommends the intake of 400 μg of FA daily before pregnancy and up to the first 12 weeks of pregnancy in low-risk groups. In high-risk patients, such as those who have had a previous child with an NTD and those taking certain anticonvulsants, a daily intake of 4 – 5 mg is recommended [10].

Countries that implemented mandatory fortification of food with FA experienced a significant decrease in the incidence of NTDs [11].

The prevalence of NTDs did not decline in Japan, despite the recommendation of the Japanese government regarding the use of FA supplements in 2000; the percentage of Japanese women who take FA supplements is only at 10 – 20% [12,13].

In an effort to reduce the incidence of NTDs, the Japanese Teratology Society released a message in 2018 that stated that women who are planning to get pregnant should...
Table 1. Knowledge, perception, and behavior regarding folic acid use

<table>
<thead>
<tr>
<th>Character</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 Knows what “folic acid” is?</td>
<td>94.22%</td>
<td>5.44%</td>
<td>0.33%</td>
</tr>
<tr>
<td>Q2 Knows which food (s) contain folic acid?</td>
<td>58.33%</td>
<td>40.89%</td>
<td>0.78%</td>
</tr>
<tr>
<td>Q3 Knows that folic acid intake can prevent NTDs?</td>
<td>75.00%</td>
<td>24.22%</td>
<td>0.78%</td>
</tr>
<tr>
<td>Q4 Sources of folate/folic acid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary supplements</td>
<td>57.89%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foods/vegetables</td>
<td>29.22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortified foods</td>
<td>2.78%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTC drugs</td>
<td>1.11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>9.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5 Is the distribution of folic acid supplements by local governments a good strategy?</td>
<td>Yes 96.78%</td>
<td>No 1.22%</td>
<td>N/A 2.00%</td>
</tr>
</tbody>
</table>

Around 900 pregnant women from seven cities/towns participated in a survey about their knowledge, perceptions, and behavior regarding folic acid use from April 2018 to March 2019. The questions were as follows: Q1: Do you know the nutrient “folic acid”?; Q2: Do you know which food (s) contain folic acid?; Q3: Do you know that sufficient intake of folic acid before pregnancy could prevent neural tube defects such as spondylosis and anencephaly?; Q4: What are your sources of folate/folic acid intake? (How did you consume it?); Q5: Is the distribution of folic acid supplements by local governments a good strategy for supporting the healthy growth of babies and promoting the health of pregnant women?

This study has some limitations as the health promotion project was executed by the local government through PPPs; this affects the generalizability of the findings across other local governments and the country in general. First, this project was not designed as an interventional study or as a longitudinal survey and was instead conducted as a part of a health promotion policy. This is because the primary purpose of this project was not to conduct surveys to obtain statistics on FA supplement use but to conduct educational activities that aimed to solve health issues as a part of the health promotion policy of the local government. In other words, the insufficient intake of FA supplements by women of child-bearing age has been established by previous studies in Japan. Therefore, the project reported here was focused on implementing educational activities for mothers without adding a burden on on-site public health nurses. The Japanese government has clearly stated that a daily intake of 400 μg of FA is recommended for women who are planning to get pregnant. However, efficient implementation of educational programs regarding FA supplementation for women as a public health measure was not reported well. The purpose of this project was to evaluate and provide evidence on the feasibility of such a program in solving public health issues through PPPs. The use of PPPs is a feasible and effective way for local governments to implement public health policies to solve health-related issues.

6. Limitations

This study has some limitations as the health promotion project was executed by the local government through PPPs;
nal and child health.

Conflicts of interest

Seika Kamohara is a Special Research Advisor for DHC Corporation, Tokyo, Japan.

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References