

Iron Nutrition Bar for Adolescent Female in Nepal

1. Motivation

With a Human Development Index of 0.463, Nepal ranks as one of the poorest countries in South Asia and worldwide. 80% of its people are living on subsistence farming for their livelihood resulting in both under-nutrition and low education outcome (IFAD, 2013). As many parts of the country are food insecure, malnutrition in children of all ages are significantly prominent. UNICEF's 2013 statistics showed that approximately 50% of children are stunted while 10% are wasted. This number is even more severe in the hills and mountains regions (WFP, 2013). Many parents are unable to pay for proper education while some do not understand its benefit. Of those who are able to attend school, many of them are unable to study effectively as they lack the energy to do so due to under nutrition (calories and micronutrients). The issues mentioned result in more severe impacts to girls due to both cultural and physical limitations. Parents vision lower benefits for daughters to attend school, as there is a high chance that they will someday marry out to another family. This can also be implicated from the 42.8% female literacy rate compared to 65.6% male literacy rate (UNDP, 2011). Many studies support the notion that women plays an important role in developing rural economies as well as food security provision (UN Women, 2013). Some even suggested that increasing female participation in an economy like Japan's can alleviate the issue of aging population. Thus, I see an importance to focus on improving schooling outcomes for female students.

Iron is one of the most prevalent nutrition deficiencies in the world and is a major issue in Nepal where 48% of Nepalese children 6-59 months old were reported to be anemic in 2006. Most studies regarding iron deficiency in Nepal focus on its effect and prevalence in pregnant women and preschool children due to the implication on infant and child mortality rate. Nevertheless, iron deficiency also has important effects on adolescents (10-19) as well especially in adolescent females (Baral & Onta, 2009). Iron deficiency results in lowered cognitive ability in adolescent females resulting in lower scholastic outcome (More et. al., 2013). Girls who started menstruating will face even lower iron-level due to blood loss. In the case of pregnancy, anemia could result in worsened mother morbidity, mortality, as well as poor birth outcome of the children. Moreover, iron-deficiency can be transferred through generations and affects economic productivity greatly (PAHO, 2008).

One main intervention that now exists, and has been effective in increasing school attendance, education outcome, and nutrient level, is school meal provision, as implemented by both the government of Nepal and NGOs. Parents want children to attend school when they know that they will not come home hungry for lunch. Additionally, the nutrition and calories enable students to study more effectively thus improving the scholastic outcome. In an WFP study, they found that school feeding not only promoted that regular attendance but also reduced

gender disparity. Some children even moved to a near by school to become exposed to the program. Another successful program that provide incentives for children to attend classes is the oil distribution program. Oil are given to girls in class 2 to 5 if they attend 80% of their classes at the cost of 2 rupees per liter (transportation cost). The government also introduced a scholarship program providing 25 rupees per month to specific groups of children. It was a relatively successful program though the supply did not meet the demand for scholarship. Through these interventions there was an increase in overall education outcome. However, the main beneficiaries were elementary school students.

Though the enrollment rate of female students has been increasing the actual attendance and graduation rate still remain moderately low. The low attendance also affects performance in school and actual education outcome since being absent cause their studies to be discontinuous. There has been some suggestion that menstruation accounts for part of this absenteeism due to both cultural taboos and physical imparities. In later years of primary school, which is the also the age of puberty, the drop-out rates for girls are the highest. (Oster and Thornton 2009). Oster and Thornton (2009) placed importance on this issue and tried to increase adolescent female school attendance rate by providing sanitary product (Menstrual Cup) to increase their mobility. Though there was a high adoption rate and improvement in mobility, they did not find direct benefits from being allocated menstrual cups on school attendance or test scores.

This intervention will, instead, aim to provide incentives to the same group of beneficiaries and outcome, adolescent female and improving their attendance rate and educational outcome. Iron nutrition bar will be given to female students during their menstrual periods to induce them to attend classes and provide them with the nutrition needed to compensate their blood loss. This study attempts to provide incentive for female adolescent to attend school during their menstrual period. Additionally the intervention will benefit up takers in the long-term as well through increased cognitive ability during class and increased iron level transferred through childbirth. The intervention that will be introduced is not necessarily a replacement for any policy but could be a supplementary policy to existing ones such as school meal provision.

2. Description of Policy Intervention

The main purpose of this paper is to study the impact of iron bar on adolescent female school attendance and school performance. The iron nutrition bar will be made to meet the nutrient needs of female in the 10-19 age group during the menstruation period. It will act as a source of iron and folic acid which helps in red blood cell production and prevent fatigues. With the main ingredient being grains, the iron nutrition bar will also be able to fill students' stomach given them sufficient energy to concentrate with their education.

To achieve this, 50 schools will be randomly selected from the central Tarai area. This geographical area seems to be the most appropriate area for our study as both Gender empowerment measure and Human Poverty Index, are close to that of Nepal's average and would be a good representation of the population. It is important that we take Gender empowerment measure (GEM) into account since in countries with low GEM, the cause for high absenteeism in female students could be strongly caused by cultural factors that are not possible to be countered by incentive provision. The UNDP (2009, p.41) reported Nepal HPI as 35.4 in 2006 where as the number is 36.9 in Tarai. The GEM index is 0.496 for Nepal and 0.469 for Tarai. The main occupation for the population in the central Tarai region is agriculture

After gaining cooperation from all 50 schools in the area, all female students aged 10-19 in 25 schools, which were randomly picked, will be assigned to the treatment group while the other 25 schools will be in the control group. By randomizing at the school level from grade 4 and above, we aim to eliminate any school specific effect that may influence school participation and education outcome such as teacher qualification and school facility. Though randomizing at the individual level (within school) may help eliminate household specific characteristics, it may cause conflicts among those who receive and doesn't receive the treatment. Thus, we will control for the characteristics instead. Female teachers in every school will be notified about the program and explained how it works as they will be the key people in distributing the iron nutrition bars.

Treatment Group: Iron bars will be distributed to girls mid-morning or in the afternoon everyday during the week of their period (approximately one week per month). Teachers will be required to take logs of which week of the month students are receiving the iron bar to ensure that students are participating in the program and manage the stock of the product. At the same time, student attendance and grades will also have to be regulated by the teachers. These data will be collected by the program implementation team at the end of the program.

Control Group: All students in the control group will have their attendance and grades logged by teachers as normal.

After one year of implementation, the program will be assessed for its effectiveness for the first time. If the result of the program turns out to be cost-effective, then the program will continue, including more schools into the program in the second round.

3. Research Questions and Hypotheses

The main research questions of this study will focus on the impact of consumption of iron bar on school outcome.

- 1) How much does the consumption of iron bar, given the specific directions, increase school attendance rate for adolescent female?
- 2) How much does the consumption of iron bar impact test score of those exposed by the program?

4. Research Design & Methodology

Using the data from participation logs and test scores collected regularly by teachers, necessary information can be obtained. I will use randomized control experiment method to analyze the impact of the program.

By randomizing at school level, I tried to eliminate post-program differences. Nevertheless, household characteristics will still have to be controlled for. Furthermore, to be able to get a more accurate result, I will control for the effect of existing interventions in the school.

To measure the impact on school attendance:

$$(1) A_{it} = \alpha + \beta_1 X_i + \beta_4 I + \beta_5 P + \varepsilon_{it}$$

To measure change in test score

$$(2) Z_{it} = \alpha + \beta_1 X_i + \beta_4 I + \beta_5 P + \varepsilon_{it}$$

Where:

A_{it} denotes the school attendance of individual i in time t ($t=0$ is pre-intervention and $t=1$ is post-intervention)

Z_{it} denotes the semester-average test score of individual i in time t ($t=0$ is pre-intervention and $t=1$ is post-intervention)

X_i is a dummy variable taking the value 1 when student i is in the treatment group and 0 when they are in the control group

I is the vector of household characteristics

P is the vector of existing interventions

ε_{it} is a mean-zero error term

5. Expected Outcome and Potential Challenges

I expect that the impact of this program, β_I , will be positive and significant in both cases. Both participation rate and education outcome should also improve which will be identifiable through improvement in grades.

Potential challenges:

- 1) Unforeseeable shocks will have impacts on both school attendance and test scores of students. When shocks such as drought occur, parents may cut back their spending by removing their daughters from schools to work for the family instead. If such event occur during the period of intervention, its impact will have to be incorporated into the evaluation process.
- 2) The program may result in a harmful dependency where households view the iron bar as food substitute. When parents are aware that their children are being given this product on a certain week they may decide to cut back food consumption for the week, especially if the household is facing a shock.
- 3) If households are aware that their daughter is not in the treatment group, they may move their children to schools that are in the treatment group. This could result in an estimation bias.
- 4) Some students may refuse to participate due to embarrassment. Thus, giving away the iron bar may have to be done privately to avoid any possible embarrassment. Also, the program will have to depend on teacher's ability to communicate its importance to the students.
- 5) Cultural limitations could play a great role in determining the success of this program. Many parents in Nepal still do not believe in investing in daughter's education especially when they become an adolescent. Nevertheless, it is possible to try to acknowledge them about the actual benefits of education for adolescent females with statistics and various other means. I tried to exclude this effect by choosing the an intervention area with moderate Gender empowerment index, avoiding areas with high gender disparity.

Citation

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