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Changes in dietary practices of mother and child during the COVID-19 lockdown: Results from a household survey in Bihar, India

Zakir Husain a,*, Saswata Ghosh b, Mousumi Dutta c

a Economics Department, Presidency University, 86/1 College Street, Kolkata 700073, India
b Institute of Development Studies Kolkata, India
c Economics Department, Presidency University, India

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ABSTRACT

The outbreak of COVID-19, and the national-level lockdown to contain it, were expected to disrupt supply chains, lead to livelihood loss, and reduce household income. Studies anticipated a decline in food security in India, leading to a near famine-like situation. In this study, we examine the change in Dietary Score (number of food groups consumed out of a possible eight) and proportion of respondents complying with Minimum Dietary Diversity norms (consuming at least four food groups) among women aged 15–49 years and their youngest child (aged between 7 and 36 months) during the lockdown. The present study also analyses whether ownership of ration cards and contacts with the party in power locally helped the household to tide over the crisis. The data was collected through a two-phase primary survey undertaken in January-March 2020 (pre-lockdown period) and October-November 2020 (post-lockdown period). It was undertaken in six districts of Bihar, a state with a history of poor maternal and child health outcomes and dysfunctional delivery of health services. We find that dietary practices of women deteriorated, while that of children remained the same. The deterioration is less among households owning ration cards or having political contacts. The analysis suggests that, during pandemics or similar crisis periods, the need to supplement the supply of staple items through the Public Distribution System with a direct transfer of cash will allow households to maintain diversity in the consumption basket.

1. Introduction

During the first wave of COVID-19, in the absence of vaccination, many countries adopted lockdowns to contain COVID-19. The lockdowns were expected to aggravate the existing global recessionary trends resulting in loss of livelihood and increases in unemployment, poverty, and inequality (Laborde et al., 2020a, 2020b; Summerton, 2020; Swinnen, 2020b; Swinnen and McDermott, 2020b). Estimates indicate that the number of people below the poverty line would increase by 140 million, of whom 42 million will be from South Asian countries (Laborde et al., 2020a). The declining income, combined with disruptions in supply chains (Swinnen and McDermott, 2020a), was also expected to create food insecurity (Summerton, 2020). Consumption was projected to decline by 3.7 per cent in South Asia (Laborde et al., 2020a). Studies also predicted a declining demand for vegetables, fruits, and animal-sourced foods, which would reduce the intake of essential micronutrients. The poorest households, who are estimated to spend 70 per cent of their incomes on food items, were susceptible to income shocks (Laborde et al., 2020a). The number of people in LMICs facing acute food insecurity was expected to double to 265 million by the end of 2020 (World Food Programme, 2020). Women and children were expected to be vulnerable to such food shocks (Swinnen and McDermott, 2020b).

Starting on 25th March 2020, the Government of India announced one of the most stringent national-level lockdowns, which continued till 31st May 2020. This paper examines changes in the dietary practices of married women aged 15–49 years and their youngest child aged 7–36 months during the lockdown in rural Bihar, India. We also examine whether the Public Distribution System (PDS), a take-home ration (THR) system operating in India since the 1960s, succeeded in minimizing the potential effect of the lockdown on dietary practices. Bihar was chosen because it is a resource-poor under-developed region, with a long history of poor maternal and child health indicators (Indian Council of Medical Research et al., 2017), and inadequate delivery of health and nutrition-related services (Avula et al., 2020). Simultaneously, the absence of a strong agricultural infrastructure made Bihar susceptible to the...
The study differs from existing studies by using a baseline survey undertaken in Bihar between January-March 2020 (before the lockdown), followed by an end-line survey in October-November 2020 (after the lockdown), rather than relying on a recall of pre-lockdown dietary practices. This is likely to reduce the possibility of social desirability bias. Secondly, unlike the existing studies that restrict themselves to exploratory analysis, we have used the Difference-in-Difference (DiD) method and ordered probit models to analyse the data. Thirdly, we have undertaken an econometric analysis of the PDS and how having ration cards affected dietary diversity using the DiD model. To check the robustness of our model in the presence of possible endogeneity, we have used kernel estimates (Kreider et al., 2012; McCarthy et al., 2015).

Given that COVID-19 is projected to remain at least for the next year, recurring in repetitive waves (Leung et al., 2020), and that current relief measures have implementation and leakage-related issues (Khan, 2020a, 2020b; Press Trust of India, 2020; Singh, 2020), this knowledge should be useful in designing bailout measures to ensure food security, reduce leakages, and make such policies more inclusive. Further, the results of this study should also help to improve service delivery to vulnerable sections in the context of disasters.

The paper is structured as follows. Section 2 starts with a critical review of existing studies. It proceeds to state research questions and describe the sampling design and strategy, and the methodology used to analyse the data. Section 3 presents the empirical results. It starts with an exploratory analysis of how the lockdown affected the dietary practices of the respondents and their children using univariate statistics and bivariate tables. This discussion is followed by an econometric analysis of the data. Section 4 discusses the implications of the results and is followed by a section on the limitations of the study. Section 6 concludes by summing up the results and stating policy recommendations.

### 2. Materials and methods

#### 2.1. Literature review

In India, there has been a large number of studies analysing changes in consumption during the lockdown. A review of the large-scale surveys reveals deterioration of consumption standards with people eating less than usual and a lingering effect on income and consumption even after the lockdown ended. For instance, 35 per cent of migrant workers belonging to the informal sector were found to be eating less than two meals per day (ActionAid, 2021), while 50 per cent of workers in the informal sector were found to be eating less than usual (PRADHAN et al., 2020). Similarly, a study in Bihar reported that 60 per cent of migrant workers were eating less than two meals per day (ActionAid, 2021).

### Table 1

Summary of studies on decline in consumption during lockdown in India.

| Indicator and source                                      | Reference period (2020) | Incidence (%) |
|-----------------------------------------------------------|-------------------------|---------------|
| Eating less food than before (%)                          | April-May               | 77            |
| CSE-APU (Round 1)                                         | May                     | 67            |
| ActionAid (Round 2)                                       | October                 | 53            |
| Hunger Watch                                              | Sept-Nov                | 60            |
| CSE-APU (Round 2)                                         |                         |               |
| Smaller meal size or fewer items in meals (%)             | April                   | 68            |
| PRADAN + (Round 1)                                        | May                     | 26            |
| PRADAN + (Round 2)                                        | June                    | 55            |
| Gaon Connection                                           | June-July               | 46            |
| IDinsight + (Round 2)                                     | July                    | 14            |
| IDinsight + (Round 3)                                     | September               | 13            |
| RCRC (Round 2)                                            | December 2020 - January 2021 | 40 |
| Fewer meals (%)                                           | April                   | 50            |
| PRADAN + (Round 1)                                        | June                    | 43            |
| PRADAN + (Round 2)                                        | June-July               | 38            |
| Gaon Connection                                           |                         |               |
| Eating less than two meals a day (%)                      | May                     | 34            |
| ActionAid (Round 1)                                       | June                    | 19            |
| ActionAid (Round 2)                                       |                         |               |

**Note:** The last column indicates the proportion of affected households (or individuals, in the case of ActionAid).

**Source:** (Dreze and Somanchi, 2021, p. 14).

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**Fig. 1.** Trends in per capita monthly consumption expenditure. Note: Calculated from CPHS (CMIE) data. Households are grouped by per capita expenditure quantiles. Figures are weighted to account for sampling design. ()

**Source:** Dreze and Somanchi, 2021, p. 17
workers were unable to ensure two meals per day for their family members (Dreze and Somanichi, 2021). A summary of the findings is given in Table 1.

An analysis of data from the longitudinal Consumer Pyramid Household Surveys (CPHS) undertaken every month by the Centre for Monitoring Indian Economy reveals a declining trend from the last quarter of 2019 well before the first case was reported in India (Fig. 1), with the recovery in consumption levels occurring before the first wave peaked in India (Gupta et al., 2021).

The analysis of item-wise changes in consumption revealed that, although the consumption of cereals and pulses remained stable, the consumption of vegetables, fruits, fish and meat declined sharply (Dreze and Somanichi, 2021; Gupta et al., 2022; Harris et al., 2020; Jaacks et al., 2021) reducing dietary diversity and increasing household food insecurity (Nguyen et al., 2021).

The decline in consumption was attributed to the substantial loss of livelihood (Adhikari et al., 2020; Agrawal and Ashraf, 2020; Centre for Sustainable Environment, 2000a, 2000b; Dalberg, 2020), leading to a shift in the per capita income distribution to the left, with the poorest 25 per cent being most affected, with slow recovery (Dreze and Somanichi, 2021). The disruption in supply chains was also identified as a contributing factor (Mabajan and Tomar, 2021; Sukhwani et al., 2020).

The studies also showed that government assistance was forthcoming. The PDS, in particular, played an important role in succouring relief during the lockdown and its aftermath (Dreze and Somanichi, 2021). It is a subsidised THR system that had been introduced in the 1960s. In 2012, based on a socio-economic survey, households were categorised into three groups: above the poverty level (APL), below the poverty level (BPL) and very poor. While the first category of households was allowed to have ration cards, they get rations at market rates. Households belonging to the other two categories are given subsidised wheat/rice, pulses, sugar and kerosene during normal times. New inductees (like children and married women shifting to matrimonial homes) are classified into these groups based on the status of their new household as in 2012. During the pandemic, the latter two groups were additionally given free rations, while the Bihar government gave Rs.1000 per month to each household. During the pandemic, studies reported that nearly all outlets (99 per cent) were open, had adequate supplies (92–99 per cent, varying across specific items) and provided the free quota to 99 per cent of eligible households, although full entitlements may not have been provided in all instances (Barboni et al., 2020). In Bihar, for instance, the PDS ensured food security among migrant workers (Inclusion Economics, 2021). In addition, the Government of India announced a Pradhan Mantri Garib Kalyan Yojana to provide relief to the population through direct benefit transfer schemes and conditional cash transfers. It was supplemented by specific measures introduced locally by the state governments. However, given that state-level elections were due in several states (including Bihar) in 2020, elite capture of such schemes for political motives may have been occurred (Kühner et al., 2021).

2.2. Research questions and hypotheses

The survey of available works reveals a bleak picture of the situation in India during the lockdown. However, there were considerable variations in the estimated incidence, timing and duration of the decline in income and consumption levels. Secondly, in the majority of studies, data had been collected in one round so there was no reliable ‘before-after’ picture. Thirdly, there has not been any econometric analysis of the changes in consumption; nor has there been any statistical analysis to identify characteristics of households that were most affected by the pandemic. Fourthly, despite evidence of the possible role of the PDS in providing a buffer against a decline in consumption, there has been no attempt to evaluate its effect statistically. Finally, while past studies have observed that when pro-poor programmes are implemented locally, “local elites are somehow able to capture majoritarian local institutions and run them in their own interests” (Anderson et al., 2015, p. 1781), this issue has been neglected in existing studies.

The present study is an attempt to address some of these deficiencies. Based on the existing studies we seek answers to the following questions:

Q1: Was there a deterioration in dietary practices during lockdown vis-à-vis earlier months?
Q2: What were the causes of the decline? Was it caused by an income effect due to the loss of livelihood? Or were the disruptions in the food chain responsible?
Q3: What are the risk factors associated with worsened dietary practices?
Q4: Did the PDS system act as a buffer, reducing the extent of dietary changes during the lockdown?
Q5: Was the deterioration in dietary standards less in households with contact with the local political party in power?

2.3. Sampling design and strategy

The data used in this study was collected through a two-phased primary survey. The baseline, representing the pre-lockdown period, was conducted between January and March 2020. It examined the prevalence of maternal and child health practices in rural Bihar and assessed the success of the Health and Nutrition Strategy (HNS) being implemented by JEEVIKA. The sample was recruited from currently women normally residing in the village aged 15–49 years and with a living child<37 months using a multi-stage sampling design. In the first stage, we selected the 13 districts, out of 38 districts of Bihar, where the JEEVIKA Technical Support program (JTSP) and HNS had been in place during the last five years preceding the survey. In the second stage, these 13 districts were classified into three tercile groups based on a composite index of human development indicators – percentages of non-SC/ST population, female literacy, and male non-agricultural labourers – using data from the 2011 census. In the third stage, two districts from each tercile group were selected randomly. The selected districts are Nalanda and Saharsha for the bottom tercile; Begusarai and Muzaffarpur from the middle tercile; and Purba Champaran and Katihar from the upper tercile. In the fourth stage, four community development blocks were randomly selected in each district based on the implementation of the JTSP and HNS programs. Two blocks were selected from those blocks where the JTSP and HNS programs had been implemented during the last five years, while another two were selected randomly from the remaining blocks. In the fifth stage, five villages from each block were selected by employing the probability proportional to size sampling method. At the last stage, 20 women comprising ten JEEVIKA members and ten non-members were selected from each village. As our objective was to evaluate the success of the JEEVIKA programme on dietary practices of women and children, we recruited the sample from ever-married women who had at least one living child aged below three years, and who was usual resident of the village. The planned sample size of the study was 2,400 (≈6 districts × 4 blocks × 5 villages × 20 respondents). The sudden onset of lockdown in March, however, forced us to stop the survey after collecting data from 2,250 respondents.

In the end-line survey, when we collected information about the

1 Only two studies use statistical methods to analyse the data (Gupta et al., 2021; Nguyen et al., 2021).

2 JEEVIKA is a World Bank-aided Bihar Rural Livelihoods Project whose objective was the social and economic empowerment of the rural poor through self-help groups in Bihar. It was introduced in 2007. A Health and Nutrition Strategy component was subsequently introduced in 2016, to improve the dietary practices of women of reproductive age and their children to build awareness about such practices through monthly meetings.
lockdown period, a list of all respondents of the first phase was prepared. Respondents who had not provided us with their mobile numbers — either because they did not have any, or because they did not want to give us their contact number — were dropped from the list. Respondents with children below three months were also dropped. Some of the background characteristics — like education and asset score (constructed using factor analysis from information on house type, drainage and sanitation) — were found to be significantly associated with respondents who were (i) not recruited for the end-line phase, and (ii) those who were recruited but not covered in the end-line survey (Appendix Table A1 and A2). It indicates the possibility of selection bias; it was corrected using the procedure suggested for the ordered probit model (Van de Ven and Van Praag, 1981).

Given travel restrictions, a telephonic survey was conducted in October and November 2020. The survey elicited information on the dietary habits of the original respondent and her youngest child, the financial status of the household, access to government relief measures during the lockdown period, and political links of family members. Since the respondents were acquainted with the survey team, lengthy introductions at the onset of the telephonic interview were avoided. This shortened duration of the interview reduced refusal rates. It also eliminated recall bias as information on the pre-COVID-19 period had already been collected. We covered 1,148 respondents, out of 1,652 respondents who satisfied the recruitment criterion (having children aged between 3 and 36 months at the time of the baseline survey). The response rate was 70 per cent, which is satisfactory for telephonic surveys. The main cause of attrition was the failure to contact the original respondent as their mobile was either not working, or was switched off. Refusal after contact was below five per cent.

In a third phase of the study, we undertook four focus group discussions of 6–8 male villagers of similar socio-economic backgrounds and conducted four interviews of migrant workers covering all the six study districts. The survey collected qualitative information on disruptions to farming operations and supply chains and the operation of PDS outlets during the lockdown.

The ethical clearances for both the studies were obtained from the Institutional Ethical Committee of the institute undertaking the study. The informed verbal consent of the respondent was obtained before the survey in both phases.

2.4. Methodology

The outcome variables studied relate to the consumption of specific food groups. The following food groups were considered for both the mother and child based on literature (FAO and FHI 360, 2016; Swindale and Bilinsky, 2006; USAID et al., 2010):

(i) Cereals and potatoes;
(ii) Pulses and nuts;
(iii) Eggs;
(iv) Fish and meat;
(v) Milk and dairy products;
(vi) Fruits that are yellow or orange inside;
(vii) Green leafy vegetables; and,
(viii) Other fruits and vegetables.

Information was collected on the number of times the respondent and her child had consumed a specific food group during the recall period. The recall period for the child was the day preceding the survey in the first phase; in the second phase, it was an average day during the lockdown. Responses were coded in binary form — it was coded as one if the child consumed the food item twice or more, and zero otherwise. As the daily intake of adults varies due to exogenous causes like the presence of guests, family occasions, etc., the recall periods of the mother were the week preceding the survey (pre-lockdown period) and the average week during the lockdown. Her responses were coded as zero (if response was infrequently, or never), or one (if response was daily, or weekly). Aggregating the number of food groups consumed by the mother and child, respectively, we created a Dietary Score (DS) (Swindale and Bilinsky, 2006). In addition, a binary indicator called Minimum Dietary Diversity (MDD) was defined with a value of one if the individual (mother or child) consumed at least four food groups, and zero otherwise (USAID et al., 2010; FAO and FHI 360, 2016). The outcomes analysed are simple, valid, reliable and commonly used metrics used to assess dietary practices and nutrient adequacy (FAO and FHI 360, 2016; Swindale and Bilinsky, 2006; USAID et al., 2010).

After an exploratory statistical analysis of the data, we undertook an econometric analysis to examine whether dietary intake had worsened during the lockdown and whether the deterioration was less among households who had obtained free rations from the PDS and who had contacts with political parties. A DiD method was used. The following regression was estimated for adult respondents:

\[
Y_a = \beta_0 + \beta_1 \text{Time } + \beta_2 \text{ Treatment } + \beta_3 \text{ Treatment } \times \text{ Control Variables}
\]

where \(Y_a\) is the outcome variable (Dietary score and whether the respondent had complied with MDD norms).

Time: Dummy taking the value of 0 for pre-lockdown and 1 for lockdown period.

Treatment: Whether the respondent had received the Treatment (Three treatments were considered and models estimated for each of them separately: whether the financial condition had deteriorated, whether free rations were obtained and whether the household had political contacts).

A negative coefficient of the time dummy indicates that dietary practices had worsened during the lockdown, while the interaction term gives the Average Treatment Effect (ATE).

Evaluation of the effects of government schemes normally faces the problem of endogeneity. In this case, for instance, it may be argued that households with low baseline dietary outcomes or who had experienced declines in dietary outcomes were more likely to be targeted during COVID-19. However, the free rations were provided to all households having BPL cards from before the pandemic, irrespective of how they were affected by the pandemic. Such ration cards had been issued to households who were less affluent in 2012—the status in 2020 was not relevant. If the household economic status in 2020 matched the status in 2012 (which is possible in Bihar as there is limited economic mobility of households) endogeneity may be an issue. As a check of the robustness of the results, we have estimated the non-parametric interval bounds of the effect of PDS on dietary outcomes (Kreider et al., 2012; Kreider and Pepper, 2007; McCarthy et al., 2015; Millimet, 2011). This method is based on minimal assumptions, viz. no false positives (those not getting free rations will not claim to have benefitted from the PDS) and positive monotonic treatment selection (households who received free rations are more likely to also have experienced a deterioration in dietary outcomes).

To identify the risk factors associated with deterioration of dietary

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3 The introduction of mobile phones has increased teledensity in India—it is 57.99 connections per 100 persons in rural areas (Telecom Regulatory Authority of India, 2020). Hence, a telephonic survey is a viable survey method, even during COVID-19 (National Council of Applied Economic Research, 2020).

4 Regression models of changes in dietary outcomes on asset holdings and other control variables revealed that the decline in dietary outcomes was not related to asset holdings.

5 A logit model regressing treatment on age, education, asset score, socio-religious identity, household size, work status and whether the husband is a migrant indicates that older and poorer respondents, those whose husbands are migrants and Muslims are more likely to be treated.
practices we created two variables:

(i) Change in Dietary Score: We created \( \Delta DS \equiv DS_{\text{Lockdown}} - DS_{\text{Pre-lockdown}} \) when DS is Dietary Score. Based on this score, three ordered categories were formed (deterioration, no change, and improvement).

(ii) Change in Minimum Dietary Diversity: Using the information on whether the respondent had complied with MDD norms (i.e. consumed at least four out of eight possible food groups) in pre-lockdown and lockdown periods, we created a variable with three possible values: complied with MDD norms in the pre-lockdown period but not in the lockdown period (Deterioration), complied with MDD norms only in the lockdown period (Improvement), with the residual category representing no change.

They were regressed on age, education, and socio-religious identity of the respondent, whether the respondent is employed, husband’s occupation, whether the husband was a migrant, household size, possession of a ration card, and contacts with the ruling political party. Although an index to capture economic status was estimated, we did not use it in the regressions as it was highly correlated with education and changes in financial condition during the lockdown. Models were estimated for women and children separately. In the model for children, the age and gender of the child were additionally included. As mentioned earlier, we adjusted for the non-random selection of respondents using the procedure suggested by de Ven and Praag (1981) and taking ownership of a mobile phone as an instrument. The independence of the first and second stage models \( p = 0 \) was tested. The hypothesis was accepted for the models estimated for women, so that (unadjusted) probit models are reported; in the case of the models for children the hypothesis that \( p = 0 \) could not be accepted at the 5 per cent level, and adjusted ordered probit models are reported.

### 3. Empirical results

#### 3.1. Sample characteristics

The sample profile is given in Appendix Tables A3 (for continuous variables), and A4 (for categorical variables). Respondents are aged between 17 and 47 years, with a mean age of 26 years; about 45 per cent are in the 21 to 25-year category. Most respondents have 6 to 10 years of schooling; about a third have no education. Most of the respondents reside in households with 6–10 members; the mean household size is 7. The normalised asset score ranges from 0 to 100, with a mean of 38.66 and median of 38.29; about 38 per cent of respondents belonged to the top asset tercile.\(^6\) Another index, based on housing quality, has a mean and median of 51.01 and 49.30, respectively, and ranged from 7.13 to 100. The majority of respondents (58 per cent) belong to the Hindu-Other Backward Caste group (H-OBC); Hindu General Castes (H-GC) also comprise a numerically large proportion of respondents (26 per cent). Only 15 per cent of the women are engaged in income-earning activities. The average number of ever-born and living children is three in both cases, with a maximum of 10 and 8, respectively. Male children comprise 52 per cent of the child sample; their average age is 17 months, varying from 3 to 36 months at the time of the first survey.

#### 3.2. Changes in the dietary practices

The mean DS of women decreased from a pre-lockdown level of 5.65 food groups (out of a possible eight) to 5.16, with the decrease being statistically significant at a one per cent level \((t = 7.60)\). The decline in mean DS is highest among women belonging to H-GC households and families in the highest asset tercile class, and among women with below primary education (Table 1). A decline in the proportion of women attaining MDD was also observed. While 93.90 per cent of mothers had attained MDD before lockdown, the proportion declined to 83.45 per cent during the lockdown. The difference of 11 percentage points is again statistically significant at a one per cent level \((z = 8.21)\). Women with below primary education, those belonging to H-OBC and H-GC households, and households in the lowest asset tercile group are most affected (Table 2).

In the case of children, although the mean DS was very low both before and during the lockdown, it increased from 2.89 to 3.15; the difference of about 0.26 per cent is statistically significant at one per cent level \((t = 4.75)\). The mean DS is low for children of both genders. It is marginally higher among girls, compared to the boys. The gender difference in DS is statistically insignificant in both periods. DS has increased by about 11 per cent for both boys and girls over the lockdown period. It also increases for children aged 7–18 months DS also increases for sub-samples formed based on housing index scores of families, education level of mothers and socio-religious identity (Table 3).

Compliance with MDD norms is low among children---about 46 per cent do not achieve the recommended level of MDD in either of the two periods. It has, however, increased marginally from 32.70 per cent before lockdown, to 34.29 per cent during the lockdown—although the difference is not significant \((z = 0.75)\). In the pre-lockdown period, the percentage of boys and girls who have adhered to the MDD norm is low—32 and 34, respectively (Table 3). However, this is not a statistically significant difference. In the lockdown phase, there is an increase in the percentage of boys attaining MDD by three percentage points. In the case of girls, however, there is a marginal decrease. The temporal change is insignificant in both cases. The percentage of children complying with MDD increases throughout our study for most sub-

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\(^6\) The asset tercile groups had been formed based on data on 2,250 respondents from the baseline survey.
samples (Table 3). The exceptions are children aged above 12 months, and from families with medium and high asset holdings, children whose mothers have 6–10 years of schooling, and children from H-SC&ST and Muslim families.

In the case of children, the lockdown seems to have had less of a shock. Particularly children aged 7–12 months report a significant improvement in mean DS and compliance with MDD norms. This result may be partly explained by the substitution of breast milk with complementary food as there is a gap of several months between our survey and re-survey periods. This is supported by the results of Table 3 indicating that dietary practices of older children (aged 19–36 months, particularly 23–36 months) were found to have deteriorated—though not significantly. Moreover, arguably children require little food so they are not major competitors for food except in periods of famines.

Table 3

| DS | Pre-lockdown | Lockdown | Difference (%) | t-statistic |
|----|--------------|----------|----------------|-------------|
| **Gender of the child** | | | | |
| Male | 2.85 | 3.16 | 11.12 | –3.40*** |
| Female | 2.90 | 3.23 | 11.20 | –3.31*** |
| **Age of child** | | | | |
| 7–12 months | 2.21 | 3.22 | 45.93 | 7.45*** |
| 13–18 months | 2.91 | 3.25 | 11.50 | 2.63*** |
| 19–24 months | 3.14 | 3.20 | 2.01 | 0.43 |
| 25–36 months | 3.18 | 3.12 | –1.81 | –0.46 |
| **Housing Index** | | | | |
| Low | 2.96 | 3.50 | 18.24 | 4.71*** |
| Medium | 2.92 | 3.16 | 8.22 | 1.96* |
| High | 2.76 | 2.97 | 7.61 | 1.92* |
| **Education of the mother** | | | | |
| No Education | 3.06 | 3.52 | 14.83 | 3.68*** |
| 1–5 years | 2.79 | 3.02 | 8.14 | 1.63* |
| 6–10 years | 2.88 | 3.08 | 7.10 | 1.75* |
| 11–17 years | 2.58 | 3.01 | 16.76 | 2.49** |
| **Socio-religious group** | | | | |
| H-SC&ST | 2.55 | 3.25 | 27.11 | 2.72*** |
| H-SC&ST | 2.88 | 3.11 | 27.11 | 2.72*** |
| H-General | 2.87 | 3.30 | 15.18 | 3.28*** |
| Muslim | 3.13 | 3.36 | 7.52 | 1.49 |
| **MDD** | | | | |
| Pre-lockdown | | | | |
| Male | 31.66 | 34.87 | 10.13 | 0.07 |
| Female | 33.86 | 33.63 | –0.67 | –1.07 |
| Age of child | | | | |
| 7–12 months | 15.67 | 36.41 | 123.35 | 2.16** |
| 13–18 months | 34.63 | 35.02 | 1.13 | 0.04 |
| 19–24 months | 38.42 | 35.79 | –6.85 | –0.26 |
| 25–36 months | 40.29 | 30.94 | –23.21 | –1.10 |
| Housing Index | | | | |
| Low | 34.46 | 43.92 | 27.45 | 2.50** |
| Medium | 34.32 | 34.65 | 0.96 | 0.09 |
| High | 29.74 | 25.66 | –13.72 | –1.19 |

Table 4

ATE of financial condition, obtaining free rations and political contact.

| ATE of worsened financial conditions | Lower DS | Decreased compliance with MDD |
|-------------------------------------|---------|------------------------------|
| Coeff | Std. Err. | Coeff | Std. Err. |
| Lockdown | 0.27*** | 0.06 | 0.57*** | 0.10 |
| Worsened financial condition | 0.02 | 0.06 | 0.06 | 0.12 |
| ATE of worsened financial condition | –0.08 | 0.09 | –0.05 | 0.15 |
| Control variables | Yes | Yes |
| Model statistics | N | 2252 | 2252 |
| $\chi^2$ | 129.87*** | 105.03* |
| Pseudo R$^2$ | 0.02 | 0.07 |

| ATE of political contacts | Lower DS | Decreased compliance with MDD |
|---------------------------|---------|------------------------------|
| Coeff | Std. Err. | Coeff | Std. Err. |
| Lockdown | 0.52*** | 0.08 | 0.86*** | 0.14 |
| Obtained rations | –0.01 | 0.07 | 0.10 | 0.14 |
| ATE of rations | –0.31*** | 0.09 | –0.39*** | 0.17 |
| Control variables | Yes | Yes |
| Model statistics | N | 2250 | 2252 |
| $\chi^2$ | 140.29*** | 110.94* |
| Pseudo R$^2$ | 0.02 | 0.07 |

Note: Control variables included are age, education, and socio-religious identity of the respondent, whether she is employed, husband’s occupation, whether the husband was migrant, household size, and (in children’s models only) age and gender of the child.

$^*P < 0.05, ^**P < 0.01$ and $^{***}P < 0.001$.

3.3. Why did dietary practices change?

Studies of the changes in consumption expenditure and intake during the lockdown in India report a significant loss of livelihood (Deere and Somanchi, 2021; Gupta et al., 2021); the resultant reduction in household income is a possible cause of the observed decline in dietary practices of women. About 61 per cent of respondents reporting a failure to comply with MDD norms during lockdown belong also report a decline in financial condition. Results of the DiD model for DS and MDD estimated for women are presented in Table 4. The coefficients of the time dummy are positive and significant at a 1 per cent level (0.27 for DS and 0.57 for MDD), indicating that dietary practices have worsened during the lockdown. Although the ATE of worsening financial condition is negative it is statistically insignificant even at a 10 per cent level.

It implies that the income effect has not led to the observed deterioration in dietary practices. While income did fall during the lockdown (confirmed in our qualitative survey), the potential adverse effect was partly offset—as we will see later on—by the low prices and surplus in the villages. Traditional coping mechanisms like borrowing money or

$^7$ it is uniformly positive and significant at a one per cent level in all six models.

$^8$ Similar findings are obtained from the non-parametric estimates: 0.00 to –0.018 (minimum dietary diversity) and 0.00 to –0.034 (dietary score).
food from relatives and neighbours also helped families to tide over the crisis.

Disruptions in the supply chain had led to food shortages and a sharp rise in prices in urban areas (Mahajan and Tomar, 2021; Sukhwani et al., 2020). Discussions with farmers, however, revealed a somewhat different picture in rural areas. It was pointed out that most of the vegetables and rice were grown within the village itself. Farming operations affected by disruptions in the supply of fertilisers and other inputs. But, farmers reported that they were not completely halted. Simultaneously, the return of the migrants from the cities implied that labour for agricultural operations would not be a problem. In addition, as the police entered the village, they returned to their home till the police left. Some of the more enterprising villagers transported their products to district markets. As a result, food items like chicken and eggs also became cheaper as agro-food units, which normally purchase these items from the farmers, closed down temporarily during the pandemic. Villagers reported that supplies of vegetables and fruits) did fall and their prices shot up; it may have reduced the diversity in the consumption basket.

Some vegetables and fruits) did fall and their prices shot up; it may have reduced the diversity in the consumption basket.

### Table 5
Results of ordered probit model for women and children.

| Variables | Dietary score | Compliance with dietary norms |
|-----------|---------------|--------------------------------|
|           | Women | Child | Women | Child |
| Child’s age (6–12 months) | – | 0.31*** | – | 0.39*** |
| 13–24 months | – | 0.43*** | – | 0.55*** |
| 25–36 months | – | 0.05 | – | 0.01 |
| Age of respondent (Below 20 years) | 0.03 | 0.15 | 0.22* | 0.32** |
| 21–25 years | 0.14 | 0.24* | 0.39*** | 0.48*** |
| 26–30 years | –0.02 | 0.31* | 0.29* | 0.37** |
| At least 5 years of schooling | –0.10 | 0.15* | 0.01 | 0.15* |
| Sociodemographic group (H-General) | – | 0.15* | – | 0.36 |
| H-SC&ST | –0.20 | –0.22 | –0.31* | –0.05 |
| H-SCB | 0.04 | 0.12 | 0.09 | –0.06 |
| Muslim | –0.23 | 0.12 | 0.14 | 0.03 |
| Respondent works | –0.13 | 0.07 | 0.03 | 0.09 |
| Household size | 0.01 | –0.01 | 0.02 | –0.02 |
| Husband is migrant | 0.15* | –0.36 | 0.05 | –0.23 |
| Occupation of husband (Wage & Salaried) | – | 0.15 | 0.12 | 0.30** |
| Occupation was done | –0.02 | 0.01 | 0.03 | 0.10 |
| Holding of irrigated land | –0.00 | –0.00 | –0.00 | –0.00 |
| Financial condition improved during the lockdown | –0.01 | –0.02 | 0.06 | 0.11 |
| Obtained free rations | –0.24** | –0.09 | –0.30*** | –0.16* |
| & | – | 0.38 | – | –0.36 |
| Cut1 (Improved vs Same & decline) | 0.91 | 0.75 | 0.41 | 0.77* |
| Cut2 (Improved & Same vs decline) | 0.86 | –0.87** | –0.04 | 0.26 |
| Model statistics | 1126 | 2043 | 1126 | 2043 |
| Uncensored observations | 942 | 942 | 942 | 942 |
| χ²-statistic (p = 0) | 2.49 | 7.78 | 6.79 | 7.11 |
| Wald χ²-statistic | 2.49 | 7.78 | 6.79 | 7.11 |
| Pseudo-R² | 0.02 | 0.39 | 0.02 | 0.507 |

Note: [1] The model for children was adjusted for self-selection using ownership of mobiles as an instrument. [2] *P < 0.05, **P < 0.01 and ***P < 0.001.

### Table A1
Comparison of profile of respondents from base-line survey not recruited, and not covered with respondents selected in end-line survey.

| Socio-economic characteristic | Not recruited | Not covered | Covered | Total |
|-------------------------------|---------------|-------------|---------|-------|
| Education of respondent | 60.44 | 37.04 | 30.31 | 32.46 |
| 1–5 years | 19.63 | 17.78 | 18.73 | 18.42 |
| 6–10 years | 17.13 | 35.19 | 35.71 | 35.55 |
| 11–17 years | 2.80 | 10.00 | 15.24 | 13.57 |
| X² | 123.40 | 1.57 (0.67) |
| Age of respondent | 9.97 | 10.37 | 10.80 | 10.66 |
| 17–20 years | 40.19 | 45.00 | 44.77 | 44.85 |
| 21–25 years | 38.32 | 35.74 | 33.8 | 34.42 |
| 26–30 years | 11.53 | 8.89 | 10.63 | 10.07 |
| X² | 3.07 (0.38) | 12.77 (0.01) |
| Occupation of husband | 20.94 | 20.56 | 16.90 | 18.07 |
| Primary | 66.88 | 60.00 | 64.63 | 63.15 |
| Other rural occupations | 12.19 | 19.44 | 18.47 | 18.78 |
| X² | 8.43 (0.02) | 4.15 (0.13) |
| Housing Index tercile | 2.49 | 7.78 | 6.79 | 7.11 |
| Class | 40.48 | 31.85 | 30.84 | 34.49 |
| Medium | 30.47 | 34.07 | 32.49 | 32.27 |
| High | 25.44 | 34.07 | 36.67 | 32.24 |
| X² | 35.01 (0.00) | 1.09 (0.58) |
| Socio-religious groups | 47.98 | 52.78 | 58.36 | 56.58 |
| H-SC&ST | 39.25 | 33.33 | 26.39 | 28.61 |
| H-SCB | 10.25 | 6.61 | 8.45 | 7.70 |
| Muslim | 28.80 (0.00) | 11.31 (0.01) |

Note: Not recruited: Respondents not recruited for end-line survey as they did not have a mobile number; Not covered: Respondents who could not be contacted or refused to give interviews; Covered: Respondents covered in end line survey ("covered"). Comparisons are with Covered group. Figures in parentheses are probability values.

### Table A2
Results of ordered probit to check selection bias.

| Variables | Coef. | Std. Err. | z | P > z |
|-----------|-------|-----------|---|-------|
| Socio-religious group (H-General) | 0.26 | 0.09 | 2.92 | 0.004 |
| H-SC&ST | 0.05 | 0.11 | 0.46 | 0.65 |
| H-SCB | –0.15 | 0.11 | –1.32 | 0.19 |
| Muslim | 0.04 | 0.14 | 0.30 | 0.77 |
| Education of respondent | 0.24 | 0.07 | 3.35 | 0.00 |
| Below five years | 0.42 | 0.07 | 6.35 | 0.00 |
| 6–10 years | 0.61 | 0.09 | 6.54 | 0.00 |
| Age of respondent (Below 20 years) | 0.02 | 0.08 | 0.27 | 0.79 |
| 17–20 years | 0.08 | 0.09 | 0.89 | 0.37 |
| 26–30 years | 0.34 | 0.12 | 2.88 | 0.00 |
| Above 30 years | 0.01 | 0.07 | 0.17 | 0.86 |
| Housing index scores | 0.05 | 0.07 | 0.77 | 0.44 |
| Respondent is employed | 0.20 | 0.07 | 2.76 | 0.01 |
| Cut1: Not recruited | 0.01 | 0.17 | –0.32 | 0.74 |
| Cut2: Recruited but not interviewed | 0.68 | 0.17 | 3.58 | 0.00 |
| Model statistics | 2.25 | 0.01 | 4.02 |
| Observations | 750 | 2.49 | 4.90 |
| X² | 130.94 | 0.00 |
| Pseudo-R² | 0.03 |
Table A3
Descriptive statistics for the respondents.

| Variable                      | Mean   | Std. Dev. | Min  | Max  | DHS4: Bihar  |
|-------------------------------|--------|-----------|------|------|--------------|
| Age of the respondent (years) | 25.55  | 4.32      | 17.00| 47   | 28.54        |
| Years of schooling            | 5.74   | 4.81      | 0.00 | 17   | 3.93         |
| Household size                | 7.01   | 2.72      | 3.00 | 20   | 6.47         |
| No. of living children        | 2.67   | 1.43      | 1.00 | 8    | 1.41         |
| Normalised housing index      | 51.01  | 22.52     | 7.13 | 100  | –            |
| Age of the youngest child     | 16.80  | 9.12      | 3.00 | 36   | –            |

Table A4
Distribution of respondents across correlates.

| Group                          | Frequency | Percentage | DHS4: Bihar² |
|--------------------------------|-----------|------------|--------------|
| Age of the respondent          |           |            |              |
| 17–20 years                    | 124       | 10.80      | 18.52        |
| 21–25 years                    | 514       | 44.77      | 20.75        |
| 26–30 years                    | 388       | 33.80      | 17.71        |
| Above 30 years                 | 122       | 10.63      | 43.02        |
| Years of schooling             |           |            |              |
| No schooling                   | 348       | 30.31      | 54.29        |
| 1–5 years                      | 215       | 18.73      | 9.75         |
| 6–10 years                     | 410       | 35.71      | 32.50        |
| 11–17 years                    | 175       | 15.24      | 3.46         |
| Socio-religious groups         |           |            |              |
| H-SC&ST                        | 78        | 6.79       | 20.35        |
| H-Other Backward Castes (OBC)  | 670       | 58.36      | 50.68        |
| H-General                      | 303       | 26.39      | 10.44        |
| Muslim                         | 97        | 8.45       | 18.53        |
| Household size                 |           |            |              |
| 3–4 members                    | 151       | 13.15      | 25.61        |
| 6–10 members                   | 991       | 86.32      | 67.50        |
| 11–20 members                  | 6         | 0.52       | 6.49         |
| Whether respondent works       |           |            |              |
| Yes                             | 172       | 14.98      | 12.84        |
| Housing Index tertile classes  |           |            |              |
| Low                            | 354       | 30.84      | 37.09        |
| Medium                         | 373       | 32.49      | 33.40        |
| High                           | 421       | 36.67      | 29.51        |
| Gender of the youngest child   |           |            |              |
| Female                         | 547       | 47.65      | –            |
| Male                           | 601       | 52.35      | –            |

Note: a. Figures for only the districts covered in the survey was reported in the column for DHS4: Bihar.

Table A5
Proportion of women and children consuming specific food groups in pre-lockdown and lockdown periods.

| Food Group                  | Pre-lockdown | Lockdown | Difference (%) |
|-----------------------------|--------------|----------|----------------|
| Cereals and potatoes        | 98.87        | 99.04    | 0.17           |
| Pulses & nuts               | 95.73        | 97.47    | 1.82           |
| Fish and meat               | 58.01        | 40.84    | -29.60         |
| Eggs                        | 41.90        | 36.76    | -12.27         |
| Milk & dairy products       | 35.94        | 30.91    | -5.03          |
| Yellow/orange fruits        | 22.74        | 15.12    | -8.24          |
| Green, leafy vegetables     | 88.07        | 59.67    | -28.40         |
| Other fruits or vegetables  | 84.84        | 72.65    | -12.19         |

Note: *P < 0.05, **P < 0.01 and ***P < 0.001.

leafy vegetables are grown locally and, given difficulties of marketing, should have been available within the village. The statistically significant decline in the frequency of consumption of green leafy vegetables is, therefore, surprising. Information collected on food habits through focus group discussions revealed that seasonality may have played a role in the decline in the consumption of items like spinach (Palak saag) and mustard greens (Sonar saag), which are not available in the summer. So supply-side disruptions possibly restricted the availability of fish and some vegetables but are unlikely to have played a major role in the deterioration in dietary outcomes during the lockdown. However, the analysis is not based on a statistical analysis of direct links between dietary outcomes and supply chain shocks. The link between supply-side disruptions and changes in dietary outcomes, therefore, needs to be substantiated through more detailed statistical analysis.

3.4. Identifying the risk of worsened dietary practices

We have estimated ordered probit models to identify the characteristics of households who are more likely to face a deterioration in dietary practices (Table 5). Econometric analysis indicates that dietary practices of older children (in the age groups 13–24 and 25–36 months) were more likely to worsen vis-à-vis children who were being weaned away from breastfeeding. The age of the respondent did not affect changes in the DS; older women are, however, more likely not to comply with MDD norms during the lockdown so the coefficients of socio-religious identity are statistically insignificant. The DS of respondents whose husbands are migrants is more likely to experience a decline in DS during the lockdown. Compared to wage and salaried earners, children from families whose main occupation is agriculture are more at risk concerning MDD norms. If the household had obtained free rations, it reduced the likelihood of

NFHS data reveals that, during 1998–99, only 21.5 per cent of women belonging to the 15–49 years age group consumed fish, egg, or meat once a week, while the all-India average was 31.9 per cent. During 2015–16, these percentages were 30.8 and 42.9 for Bihar and India, respectively.
women experiencing deterioration in dietary practices. In the case of children, the effect is less pronounced and significant at 10 per cent only for changes in MDD norms. Employment status of the respondent, household size, size of irrigated landholding and change in financial condition during lockdown is significantly associated with increased risks of facing deterioration in dietary practices.

3.5. Role of PDS in reducing the effect of lockdown

Government assistance took off slowly but was soon forthcoming. Although our survey indicates only 37.22 per cent of eligible households received the Rs.1000 promised to ration cardholders by the Bihar government, Direct Benefit Transfers through the Jan Dhan accounts were quite high (85.53 per cent).\(^\text{10}\) The PDS system played an important role. We found that 91.50 per cent of eligible respondents received free rations during the lockdown, with 77.61 per cent receiving the free “Sarkari (government) quota” more than twice. There were some lapses—for instance, instead of pulses, often chana (chickpeas) were supplied. This created a problem in states like West Bengal (where chickpeas are snack items), but not in Bihar, where chickpeas are part of the normal diet for lunch and dinner. But, by and large, the THR system was successful in ensuring cereals and pulses in the survey areas, thereby averting a major food crisis.

The worsening of dietary practices is observed to be less among women belonging to households who have obtained free rations. While the mean DS changed by −0.75 among women who did not have ration cards, the change was much less among women who had received rations (−0.33). The corresponding percentages for women who failed to comply with MDD norms are −20.06 and −12.94, respectively. The differences are statistically significant at 1 and 5 per cent levels for DS and MDD, respectively. The ATE of free rations on DS and MDD (−0.31 and −0.39) is negative and significant at a one per cent level, implying that the PDS reduced the potential effect of the lockdown on consumption standards (Table 4). Non-parametric estimates confirm that the ATE for minimum dietary norms was lower, but negative, (the upper bound was −7.1 per cent). The upper bound of the ATE for the dietary score, however, is positive (10.3 per cent); it implies that households who received THR were more likely to experience a decline in the dietary score.

The inconsistency in the ATE for the two outcomes may be explained as follows. The PDS supplied only cereals and pulses, which were already being consumed by the ration card holders. The free supply of these two items ensured their availability even among poor households but is unlikely to have arrested the decline in the dietary score as consumption of other items not supplied through the PDS fell. Although the dietary score declined, it fell to below 4 items for only 15 per cent of ration card holders; in contrast, the dietary score fell to below 4 items for 21 per cent of the respondents who did not get free rations.

3.6. Role of political contacts

Contacts with the political party in power in the village were also important. While the mean DS changed by −0.49 for women without political contacts, the change was −0.12 for women who had political contacts. The differences are significant at a five per cent level. Compliance with MDD norms changed by −16.20 among women without political contacts, but by only −5.69 if the respondent had political contacts. The differences are significant at a one per cent level. The econometric results for political contacts are mixed (Table 4). The ATE of political contacts in the model for DS is negative but insignificant; political contacts, however, increase the probability of increased compliance with MDD norms by 4.2 per cent.\(^\text{11}\) A possible reason for this result is that political contacts increased access to food supply indirectly, assisting the household to obtain monetary transfers and free gas cylinders, thereby freeing resources for expenditure on food items.

4. Discussion

Our study found that the dietary practices of women may have worsened significantly during the lockdown. The change among children, moreover, was marginal and occurred mainly among those aged one year or more. There was also a possible decrease in the diversity of the consumption basket with a reduced intake of eggs, fish and meat, and green leafy vegetables. The loss of livelihood does not seem to have played a role in this deterioration. Availability of free allotments of cereals and pulses under the PDS and political contacts possibly offered households some degree of protection from the potential effects of the lockdown. Apart from older children and respondents, the risk of experiencing deterioration in dietary diversity seems to have been spread uniformly across socio-demographic groups.

Earlier studies had reported a substantial loss of livelihoods due to unemployment, fall in consumption expenditure, reduced number of meals and loss of dietary diversity. It was attributed to both demand (income effects from loss of livelihoods) and supply (breaking of supply chains) side factors. The provisioning of rations under the PDS had also been reported to be effective (Barboni et al., 2020; Inclusion Economics, 2021).

Our study contributes to the existing literature by applying econometric methods to analyse data from two phases to study how the lockdown affected dietary practices. We have evaluated the effect of the PDS in cushioning households from the potential income effects of the lockdown. We have also examined the effect of contact with the local party in power in protecting against deterioration in dietary practices. Our study found that, although dietary practices did worsen, particularly among women and comparatively older children, the extent of reduction was much less—at least among the rural population in Bihar—than reported in the studies reviewed earlier. The reported decline in consumption of nutrient-dense food items is also confirmed in our study. Differences in the population covered were a possible cause—we had covered the rural population, while the focus has often been on the all-India figures or specific sections like migrant workers or the urban population. We discuss other possible reasons for our results.

Firstly, agricultural activities showed remarkable resilience in most countries, including India (Chand, 2020), so the shock on rural households was less than what was expected (Gupta & Kishore, 2020). The government declared agri-food production and marketing as essential commodities— exempting restrictions on the movement of farmworkers, farm machinery, and farm produce—and kept agricultural markets open (Chand, 2020). Although the implementation of these decisions at the ground level was not smooth,\(^\text{12}\) fears that the supply chain disruptions would have a major consumption shock (Gillespie & Whiteside, 2020; Raghunathan, 2020) did not materialize as the rural households were located at the source of production. Studies reported that 63 per cent of farmers were able to harvest (Jaacks et al., 2021), but

\(^{10}\) The full amount was received by only 49.22 per cent of eligible households.

\(^{11}\) Estimates of upper bounds of the ATE using non-parametric methods are −0.086 and −0.04 for minimum dietary norms and dietary score, respectively.

\(^{12}\) It was reported that “vendors of fresh produce, as well as transporters, have faced considerable difficulties in securing movement passes and permissions for their operations. Several (vendors) are unaware of the rules. Overzealous law enforcers have focussed on enforcing the lockdown, rather than maintaining food supply chains. There have also been worrying reports of social and religious discrimination in many cities—barring vendors belonging to certain minority communities from selling in some neighbourhoods, or barring entry of people from some ethnic background in certain supermarkets” (Narayananan & Saha, 2020).
80 per cent of farmers reported sales being affected badly (Harris et al., 2020) so only 44 per cent were able to sell their crops (Jaacks et al., 2021) and a large part of the produce had to be self-consumed (Harris et al., 2020).

Prices did increase during the lockdown. Narayananan and Saha reports that:

“Average retail price increases are over 6% for several pulses, over 3.5% for most edible oils, 15% for potato, 28% for tomato in the 28 days’ post-lockdown compared to prices during the month preceding the lockdown. Chicken and mutton prices have increased dramatically over the past two weeks, even doubled in some cities. However, milk prices have been steady over this period” (Narayananan and Saha, 2020).

Analysis of the long-run trend in prices does not reveal any statistically significant structural break; prices of only perishable goods rose sharply, but all prices soon reverted to pre-lockdown trends (Cariappa et al., 2021). What did happen was a widening gap between wholesale and retail prices. Closures and logistics-related risks of trading had reduced prices received by farmers by almost half (Hirovonen et al., 2020). On the other end of the supply chain, the wholesale markets closed in most of the smaller towns resulting in a sharp price rise in such cities, compared to larger cities. It was the urban consumers who were affected by the dislocations in the supply chains. In rural areas surveyed, as revealed by the qualitative surveys, excess supply led to a decline in food prices, confirmed in other studies, reporting a price decline by 80 per cent of farmers surveyed (Harris et al., 2020).

A possible reason was the successful utilisation of the PDS to provide a buffer against a fall in the consumption levels.13 Although coverage of health and nutrition schemes is poor in Bihar (Avula et al., 2020), the PDS in Bihar rose to the occasion and was able to steady a supply of staples to households. Despite some cases of corruption—respondents reported receiving less than their entitled quotas, or having to pay a margin—the PDS was able to provide cereals and pulses to vulnerable households. The fact that state-level elections were due in the second half of 2020 may have also played a role in motivating the Bihar government to ensure adequate coverage under the different social protection measures. Such measures, however, were introduced after the crisis, and took time to take off; hence, their cushioning effect operated after a lag. It is not surprising, therefore, that early studies found households facing an imminent disaster (National Council of Applied Economic Research, 2020; Acharya, 2020; Centre for Sustainable Environment, 2000a; Centre for Sustainable Environment, 2000b; Gaon Connection and Lokniti-CSDS, 2020).

The looming Assembly elections had another effect. A patron-client relationship has been reported for India:

“…buying of votes and hence power, by a cadre of political elite (patrons) in return-for the delivery of direct benefits to the non-elite (clients) whose support is essential for maintenance of power. Elite patrons control government but promote benefits to their clients in a quid pro quo arrangement that may see direct transfers to clients, but that will feature governance largely in the interests of the elite” (Anderson et al., 2015).

Such "discretionary provision of private or local public goods or privileges by government officials and political parties to particular groups of citizens, in exchange for their votes" (Bardhan and Mookherjee, 2000) has been reported in several studies in India (Bardhan et al., 2009; Bardhan and Mitra, 2014; Dasgupta, 2017; Vora, 1996), and maybe expected to be important in Bihar as the Assembly elections were scheduled in 2020. The fortunate households with political contacts received an additional layer of protection from the adverse effect of the lockdown.

5. Limitations

The objective of the first round, undertaken in January-March 2020, was to assess whether JEEVIKA’s HNS had improved the dietary practices (mean DS and compliance with MDD standards). The questionnaire had been designed accordingly. The pandemic allowed us to evaluate whether dietary changes were affected by the lockdown. This, however, created a limitation. The study design became restricted to covering the indicators and the sample (women and children aged below 36 months) covered in the first round. This is why we have analysed dietary practices, rather than consumption levels or caloric intakes. Moreover, we were unable to collect data directly linking supply-side disruptions with changes in dietary outcomes. While it was theoretically possible to seek additional information on the availability of food items, prices and consumption levels, there were practical constraints like (i) the need to complete the telephonic survey within 20–30 min (Dabalen et al., 2016; Glazerman et al., 2020), (ii) poor quality of network connections in rural Bihar, (iii) lack information about prices among women, and (iv) possibility of recall bias.

Secondly, the end-line survey had been conducted over the telephone. Although the rise in mobile density implies that coverage is not a major issue with telephonic surveys, it is still less reliable than face-to-face interviews (Szolnoki & Hoffmann, 2013), particularly if questions are complex (Tipping et al., 2010). Thirdly, given the constraints under which the survey was undertaken, we had to rely on self-reported responses. It may lead to an overestimation of the effect of COVID-19 due to social desirability bias.

Nevertheless, our study tried to find out the change in dietary practices during a pandemic situation based on a scientifically selected sample of the population from the resource-constrained state of Bihar. The study has contributed to the literature on the effect of pandemics on the vulnerability of women and children in an under-developed region of a low- and middle-income country; it also provides evidence on the crucial role of THR in ensuring food security welfare during such crises.

6. Conclusion

Our study found that, during the lockdown, dietary practices of women may have deteriorated—although a famine of “biblical proportions” (United Nations, 2020) did not occur—and possibly led to a restricted consumption basket. There are indications of substitution of cereals and pulses for non-vegetarian items, dark green leafy vegetables, and other fruits and vegetables. It may be due to (i) increased dependence on the PDS leading to a higher intake of cereals and pulses; (ii) disruptions in supply chains creating a shortage of items that were not produced locally (fish, and some vegetables and fruits); and (iii) seasonal decline in the availability and consumption of items like green leafy vegetables. The dietary score and compliance levels with minimum dietary diversity norms of children were very low in the pre-lockdown period; during the lockdown, however, changes in dietary practices during the lockdown were marginal and occurred only for older children (above one year).

During pandemics, a major objective of policymaking should be to ensure food security (HLPE, 2020). At the same time, given the higher chances of morbidity and mortality among people with poor nutritional status, food security is also a means to control the transmission of pandemics (Anema et al., 2009; United Nations, 2020). Our study reveals that the PDS functioned as an effective mechanism to ensure a steady consumption of staple items (cereals and pulses). The supply of only staple items, however, does restrict the diet. Such measures should be supplemented by measures to widen the consumption basket. This will entail promoting awareness about healthy dietary practices through

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13 The large stocks of cereals and pulses acquired by the Food Corporation of India were an important factor in this context. As per its report dated 11.06.2020, FCI had 270.89 LMT rice and 540.80 LMT wheat (https://pib.gov.in/PressReleasePage.aspx?PRID=1631110).
programs like JEEVIKA’s HNS. Simultaneously, introducing supplementary social protection measures to facilitate access of vulnerable sections to food and income is necessary during pandemics. Such measures should combine a strong THR system to provide the staple items, with Direct Benefit Transfer in the form of cash to allow households to widen their consumption basket and improve their dietary intake. Finally, coverage of existing nutritional support programs targeting women and children should be strengthened during pandemics.

CRediT authorship contribution statement

Zakir Husain: Funding acquisition, Investigation, Data curation, Software, Writing – original draft. Saswata Ghosh: Conceptualization, Investigation, Writing – review & editing. Mousmuni Dutta: Conceptualization, Investigation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

See Tables A1-A5.

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