

Centralised Kitchens and School Nutrition Under Pm Poshan in Bihar: An Evaluation of Food Quality, Delivery and Stakeholder Perceptions

¹Dr. Pankaj Kumar Tiwary, ²Dr. Devendra Kumar, ³Dr. Ritu Narayan

¹Assistant Professor (Senior Grade) N. Mishra Institute of Economic Development and Social Change, Patna
Email: drpktiwary@lnmipat.ac.in

²Assistant Professor, Department of Personnel Management and Industrial Relations Tilka Manjhi Bhagalpur University, Bhagalpur, Bihar, India Email: dr.devendrakumar@tmbuniversity.ac.in

³Assistant Professor (Senior Grade) L. N. Mishra Institute of Economic Development and Social Change, Patna
Email: drnrarayan@lnmipat.ac.in

Corresponding Author : Dr. Devendra Kumar

Email: dr.devendrakumar@tmbuniversity.ac.in

HOW TO CITE: ABSTRACT

Pankaj Kumar Tiwary, Devendra Kumar, Ritu Narayan (2026). Centralised Kitchens and School Nutrition Under Pm Poshan in Bihar: An Evaluation of Food Quality, Delivery and Stakeholder Perceptions

International Journal of Special Education, 41(19s)673 - 683,

The Pradhan Mantri Poshan Shakti Nirman (PM POSHAN) programme seeks to improve children's nutrition and support regular participation in elementary education. Centralised kitchens operated by non-governmental organisations (NGOs) are used in some locations to prepare meals at scale and supply them to schools. This article evaluates the functioning of seven NGO-managed centralised kitchens serving schools in four districts of Bihar. The study uses primary field information from 48 schools and responses from 48 headmasters, 100 teachers, 187 school cooks, 505 beneficiary students and 106 students who were not consuming the supplied meal. The analysis covers infrastructure, hygiene, food quality, transportation, delivery, student participation, teacher workload and stakeholder perceptions. The evidence shows that the centralised kitchens generally had satisfactory infrastructure and hygiene arrangements and that the model reduced teachers' involvement in meal preparation. However, food taste, the time between preparation and consumption, transportation constraints, local food preferences and inadequate school-level eating space remained important concerns. The evaluation report estimated that about 61 per cent of enrolled students in the surveyed schools were MDM beneficiaries and found no specific attendance improvement attributable to the centralised kitchen arrangement. The study argues that the effectiveness of centralised kitchens depends not only on cooking capacity but also on last-mile logistics, local acceptability, school-level monitoring and infrastructure. A context-specific or hybrid model is therefore recommended, with centralised kitchens for schools with feasible connectivity and local

COPYRIGHT STATEMENT:

Copyright: © 2026 Authors.

Open access publication under the terms and conditions

the Creative Commons Attribution (CC

BY) cooking arrangements where distance, road conditions or small enrolment make centralised delivery inefficient.

license (<http://creativecommons.org/licenses/by/4.0/>).

Keywords: PM POSHAN; Mid-Day Meal; centralised kitchen; school nutrition; food quality; NGO; Bihar; rural development; service delivery; governance

Introduction

School feeding is an important social policy instrument in India because nutrition, school participation and learning are closely connected. The National Programme of Nutritional Support to Primary Education was launched in 1995 and the cooked meal component expanded following the Supreme Court's 2001 direction. The programme subsequently evolved into the Mid-Day Meal Scheme and was renamed PM POSHAN in 2021. The official programme objectives include improving nutritional status and encouraging children, particularly from disadvantaged households, to attend school regularly and concentrate on classroom activities (Ministry of Education, 2023).

The current PM POSHAN framework emphasises a hot cooked meal and gives importance to nutritional adequacy, palatability, hygiene, food safety and operational feasibility. The official guidelines also recognise transportation, food handling and quality assurance as integral parts of meal delivery. This is particularly relevant where food is prepared away from the school and transported to the point of consumption.

Centralised kitchens represent one institutional response to the practical difficulty of preparing meals separately in a large number of schools. Their potential advantages include economies of scale, dedicated infrastructure, specialised personnel, standardised procedures and reduced involvement of teachers in cooking-related activities. Their potential disadvantages arise at the distribution stage: longer travel distances, road constraints, holding time, loss of temperature and reduced local adaptation of taste.

The present study uses a field evaluation undertaken by the L. N. Mishra Institute of Economic Development & Social Change, Patna, to examine these trade-offs in Bihar. The original evaluation covered seven NGO-managed centralised kitchens and five per cent of the schools affiliated with them, amounting to 48 schools in four districts. The present article reorganises and analyses those findings through a rural-development and public-service-delivery perspective.

The article contributes to the discussion in three ways. First, it treats the school meal as a delivery chain rather than only a cooking activity. Second, it brings together the perceptions of headmasters, teachers, cooks and students. Third, it identifies the conditions under which centralised delivery is likely to work better and where a school-level or hybrid arrangement may be more appropriate.

2. Review of Literature

The literature on India's school meal programme broadly identifies three linked objectives: nutrition, school participation and educational outcomes. Early empirical work by Sarma et al. (1995), based on schools in Andhra Pradesh, reported improvements in attendance and retention and a marginal improvement in scholastic performance among programme schools. This suggests that school feeding can generate benefits beyond the immediate provision of food.

Samal and Dehury (2017), reviewing the wider family and social implications of the Mid-Day Meal Scheme, emphasised that the programme should be understood as an intervention affecting both child welfare and household well-being. The literature therefore supports a multidimensional interpretation of school meals

rather than treating them simply as a food subsidy.

More recent research has examined implementation constraints. Paltasingh and Bhue (2022) describe the Mid-Day Meal Scheme as a major social programme but highlight continuing concerns relating to nutritional adequacy, implementation, monitoring and the quality of delivery. Their discussion is relevant to the present study because a programme can have strong policy objectives but produce uneven outcomes when implementation conditions vary across locations.

Gharge and Unisa (2025) examined dropout and retention using longitudinal Indian Human Development Survey data and reported lower dropout among children who had received MDM support in earlier years. This provides evidence that school feeding may have longer-term educational associations, although such effects cannot be inferred from the present cross-sectional evaluation.

The present study addresses a comparatively narrower but operationally important gap: how the centralised kitchen model performs at the school interface. Existing research often assesses whether school meals are associated with nutrition, attendance or retention. The present evaluation instead examines whether the delivery mechanism itself preserves quality, acceptability and timely access to meals. This is particularly important in rural and semi-rural areas where transportation infrastructure differs substantially among schools.

3. Conceptual Framework

The article conceptualises PM POSHAN delivery as a five-stage service chain: (1) procurement and storage of ingredients, (2) preparation in the centralised kitchen, (3) transportation, (4) school-level receipt and quality checking, and (5) consumption by children. Outcomes depend on the interaction of these stages.

A well-equipped kitchen can improve hygiene and standardisation, but these gains can be

weakened if food remains in transit for several hours. Similarly, a nutritionally adequate meal may have limited programme value if children reject it because of taste or temperature. The framework therefore treats food quality as a combination of nutritional adequacy, hygiene, sensory acceptability and timely availability.

From a rural-development perspective, the model also has an institutional dimension. Centralisation can reduce transaction costs for individual schools and release teachers from non-teaching work, while decentralised arrangements may perform better where schools are small, dispersed or poorly connected. The appropriate institutional design is consequently conditional rather than universally centralised.

4. Research Questions and Hypotheses

The study addresses the following research questions:

- RQ1: What are the principal operational strengths and weaknesses of NGO-managed centralised kitchens in the surveyed districts?
- RQ2: To what extent do distance, transportation and holding time affect the quality and acceptability of meals?
- RQ3: What do teachers, cooks and students identify as the major areas requiring improvement?
- RQ4: Does the centralised kitchen arrangement appear to reduce teachers' non-teaching workload?
- RQ5: What delivery model is most appropriate for schools with different levels of enrolment and connectivity?

The following hypotheses guide the analytical interpretation. They are framed as propositions to be tested in future larger-sample research because the supplied evaluation report is descriptive and does not provide inferential statistical tests.

- H1: Better last-mile connectivity and shorter delivery time are positively associated with student acceptance of centrally prepared meals.

- H2: Perceived food quality and taste are positively associated with students' willingness to consume PM POSHAN meals.
- H3: Centralised meal delivery reduces the non-teaching workload of teachers.
- H4: The effectiveness of a centralised kitchen varies with school size and distance from the kitchen.

5. Methodological Issues Involved

The study is based on primary data collected in the evaluation of NGO-managed centralised kitchens in Bihar. Seven kitchens located in Madhubani, Darbhanga, Samastipur and Buxar were visited. Approximately five per cent of the schools affiliated with each kitchen were selected, giving a total of 48 schools. School selection considered distance from the kitchen and representation of SC, girls' and minority schools.

Five information schedules were used at school level. D1 captured school demographic information; D2 obtained information from

headmasters and teachers; D3 collected school cooks' views; D4 covered students consuming the centralised meal; and D5 covered students who were not consuming it. The evaluation also examined kitchen infrastructure, storage, certificates and registers, hygiene, cleanliness and equipment.

The respondent base comprised 48 headmasters, 100 teachers, 187 cooks, 505 beneficiary students and 106 non-beneficiary students. The original evaluation was conducted over approximately three months and included surprise visits to kitchens and randomly selected schools.

The present article uses descriptive statistics reported in the evaluation. Percentages are reproduced or, where necessary, directly computed from the reported counts. No causal claim is made where the underlying evaluation design does not support one.

Table 1: Coverage of the evaluation

Unit	Number
Centralized kitchens	7
Districts	4
Schools visited	48
Headmasters	48
Teachers	100
School cooks	187
Beneficiary students	505
Non-beneficiary students	106

Source: Primary Source

6.

Results and Discussion

6.1 Kitchen coverage and beneficiary participation

The beneficiary share differed markedly across the seven centralised kitchens. The evaluation reported approximately 51 per cent for

Rampatti, 61 per cent for Benipur, 63 per cent for Pagra, 54 per cent for Ara-Patna Road, 45 per cent for Navanagar, 61 per cent for Dumraon and 42 per cent for Darbhanga Sadar. The overall evaluation concluded that beneficiaries represented approximately 61 per

cent of enrolled students in the surveyed schools.

The variation is important. A centralised kitchen may have adequate production capacity, but the share of children actually receiving the meal also

depends on attendance, household preferences, school conditions and acceptance of the food. The lowest reported beneficiary share was 42 per cent in the Darbhanga Sadar cluster, while the highest was 63 per cent in the Pagra cluster.

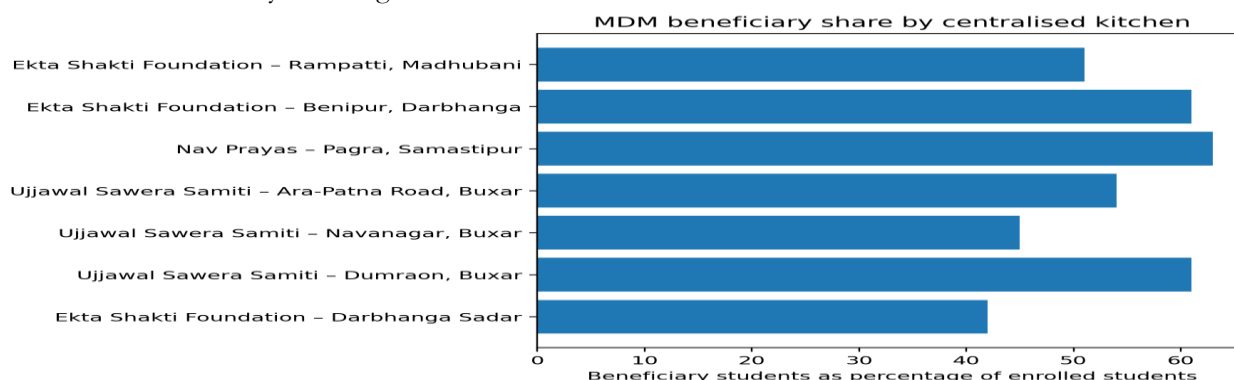


Figure 1: MDM beneficiary share by centralised kitchen. Source: Primary Source

Table 2: Beneficiary share by centralised kitchen

Centralised kitchen	Beneficiary share (%)	Grade	Score
Ekta Shakti Foundation – Rampatti, Madhubani	51	B	181
Ekta Shakti Foundation – Benipur, Darbhanga	61	B+	186
Nav Prayas – Pagra, Samastipur	63	B+	187
Ujjawal Sawera Samiti – Ara-Patna Road, Buxar	54	B	184
Ujjawal Sawera Samiti – Navanagar, Buxar	45	C+	179
Ujjawal Sawera Samiti – Dumraon, Buxar	61	B+	186
Ekta Shakti Foundation – Darbhanga Sadar	42	B	185

Source: Primary Source

6.2

Infrastructure, hygiene and food safety

The evaluation found the infrastructure of the centralised kitchens to be generally good and reported adequate staffing and relatively strong hygiene conditions. This is an important strength of the centralised model because dedicated facilities can support systematic storage, preparation and cleaning procedures.

However, food safety does not end at the kitchen gate. The school-level evaluation found that tasting registers were incomplete or unavailable in some schools, and teachers did not regularly taste the meal even though cooks generally did so. The report recommends rotational tasting by teachers and cooks before the meal is served.

About 79.17 per cent of headmasters/teachers were aware that they could refuse a meal if the food was not acceptable, the seal was broken or quality was poor; 20.83 per cent were not aware. Importantly, the evaluation did not report

corresponding instances of schools actually refusing the meal. This indicates a gap between formal awareness and practical use of quality-control mechanisms

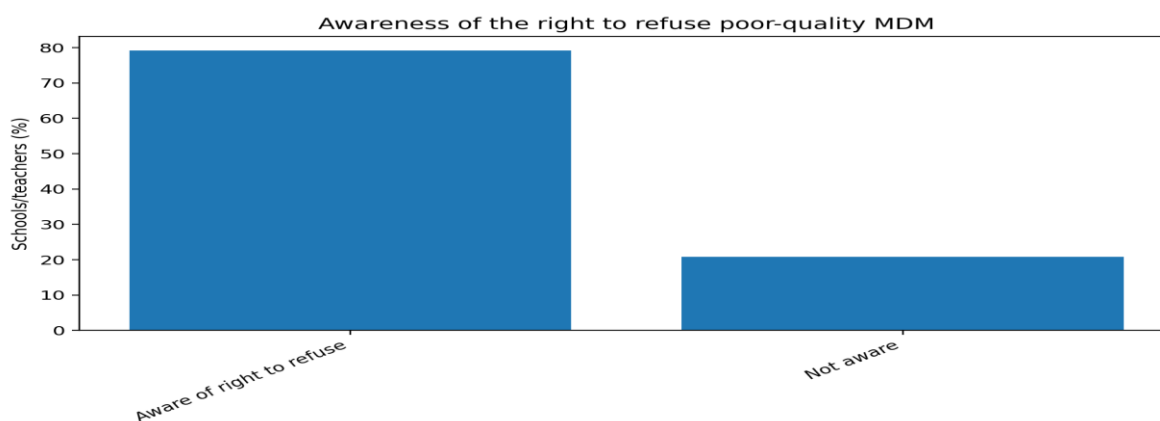


Figure 2: Awareness of the right to refuse poor-quality MDM. Source: Primary Source.

Table 3: School-level quality-control awareness

Indicator	Number	Percentage
Aware of right to refuse poor-quality meal	38	79.17
Not aware	10	20.83
Total	48	100

Source: Primary Source

6.3 Food quality, taste and student acceptance

Food taste emerged as the strongest quality-related concern. Among the 106 students who were not eating the MDM, 33 students (31.13 per cent) identified bad food taste as the reason.

Parents' instructions accounted for 19.81 per cent and mothers not allowing the child to consume the meal for 15.09 per cent. Other reasons included poor food quality, poor hygiene and excessive water in pulses and vegetables.

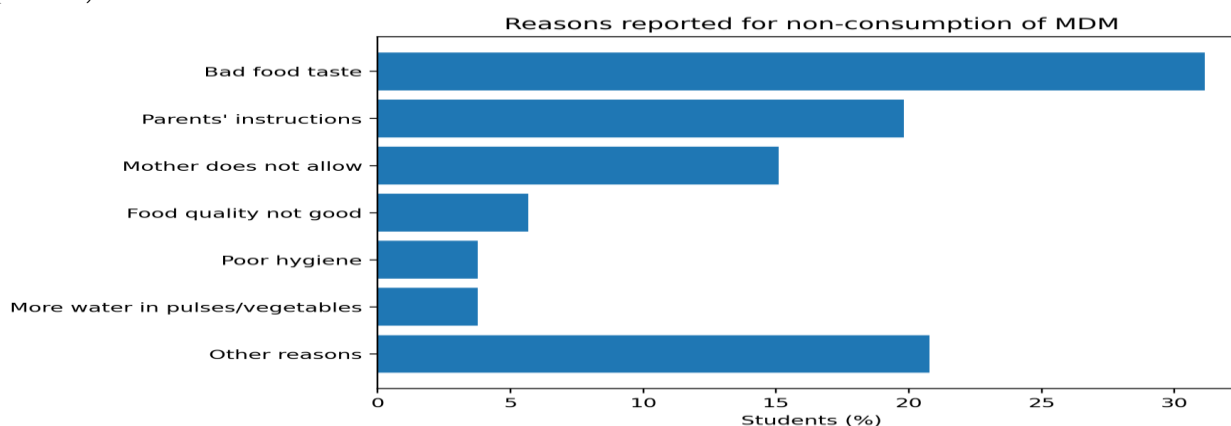


Figure 3: Reasons reported for non-consumption of MDM. Source: Primary Source.

The student responses are consistent with the views of teachers. Of the reported suggestions/comments from headmasters and teachers, 53.37 per cent concerned improvement in food quality and taste. Maintaining meal

quality accounted for another 14.86 per cent. Suggestions also included seasonal vegetables, restricting khichari to Saturday, special-day meals and additional salt.

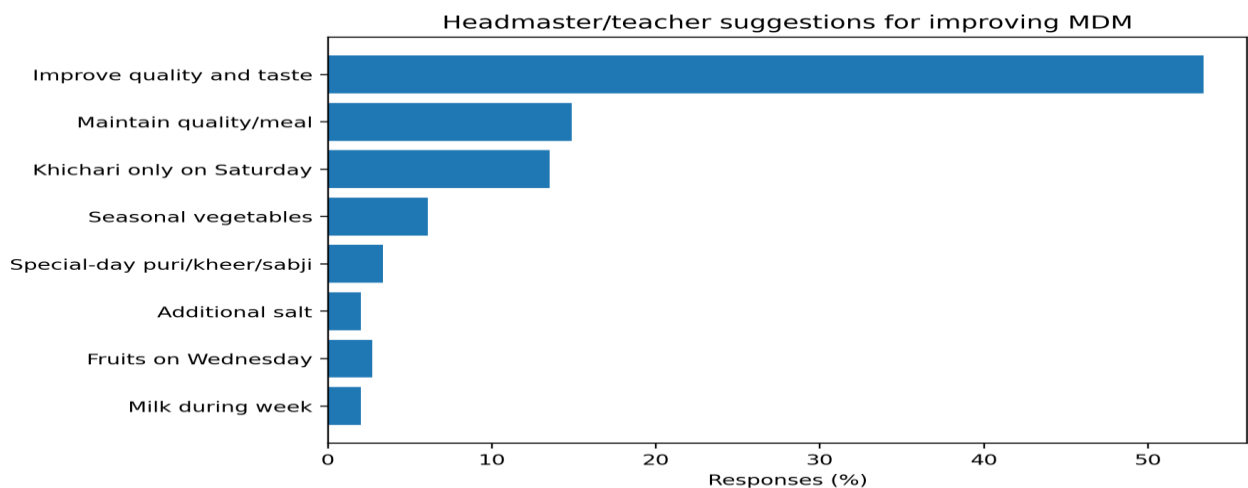


Figure 4: Headmaster/teacher suggestions for improving MDM. Source: Primary Source.

Table 4: Major reasons for non-consumption of MDM

Reason	Students	Percentage
Bad food taste	33	31.13
Parents' instructions	21	19.81
Mother does not allow	16	15.09
Food quality not good	6	5.66
More water in pulses/vegetables	4	3.77
Poor hygiene	4	3.77
Other reported reasons	22	20.77

Source: Primary Source, responses of 106 non-consuming students.

Table 5: Major headmaster/teacher suggestions

Suggestion	Responses	Percentage
Improve quality and taste	79	53.37
Maintain quality and meal	22	14.86
Khichari should be given on Saturday only	20	13.51
Include seasonal vegetables	9	6.08
Puri, kheer and sabji on special	5	3.37

day		
Fruits on Wednesday	4	2.7
Additional salt	3	2.02
Milk during week	3	2.02

Source: Primary Source

6.

4 Transportation, Distance and Time Gap

The most important structural limitation of the centralised model was the last-mile distribution system. The evaluation found schools at varying distances from kitchens, including schools approximately 15 km away. In some locations, poor road connectivity prevented delivery vehicles from reaching the school conveniently.

The evaluation further reported an approximate six-hour gap between preparation at the centralised kitchen and consumption at school. This creates a direct operational problem: even

if the meal is safe and hygienically prepared, it may not remain hot by the time children eat it. Long holding time may also affect taste and sensory acceptability.

This finding supports the proposition that the appropriate unit of planning is not simply the kitchen but the kitchen–route–school network. Supply areas should be fixed with reference to road conditions, distance, school size and feasible delivery time. The original report similarly recommended considering distance and road width/condition while defining the supply area.

Table 6: Selected operational issues identified in the evaluation

Issue	Evidence from evaluation	Policy significance
Long preparation-to-consumption interval	Approximately 6 hours	Need route optimisation and shorter holding time
Poor road connectivity in some areas	Some vehicles could not conveniently reach schools	Supply areas should reflect transport feasibility
Incomplete tasting registers	Found in some schools	Strengthen school-level quality assurance
Teachers not regular tasters	Cooks generally tasted; teachers did not regularly do so	Introduce rotational teacher tasting
Taste complaints	Bad taste was the largest student reason for non-consumption	Increase local adaptation and feedback
Limited school eating space	Some children ate in open spaces	Improve school-level infrastructure

Source: Primary Source.

6

.5 Effect on teachers and school management

The centralised kitchen arrangement has an important institutional advantage: it separates

teaching from routine cooking and meal-management work. The teacher responses show that 88.52 per cent reported no change in student–teacher interaction, while smaller

groups specifically reported more time for teaching, reduced tension and reduced workload.

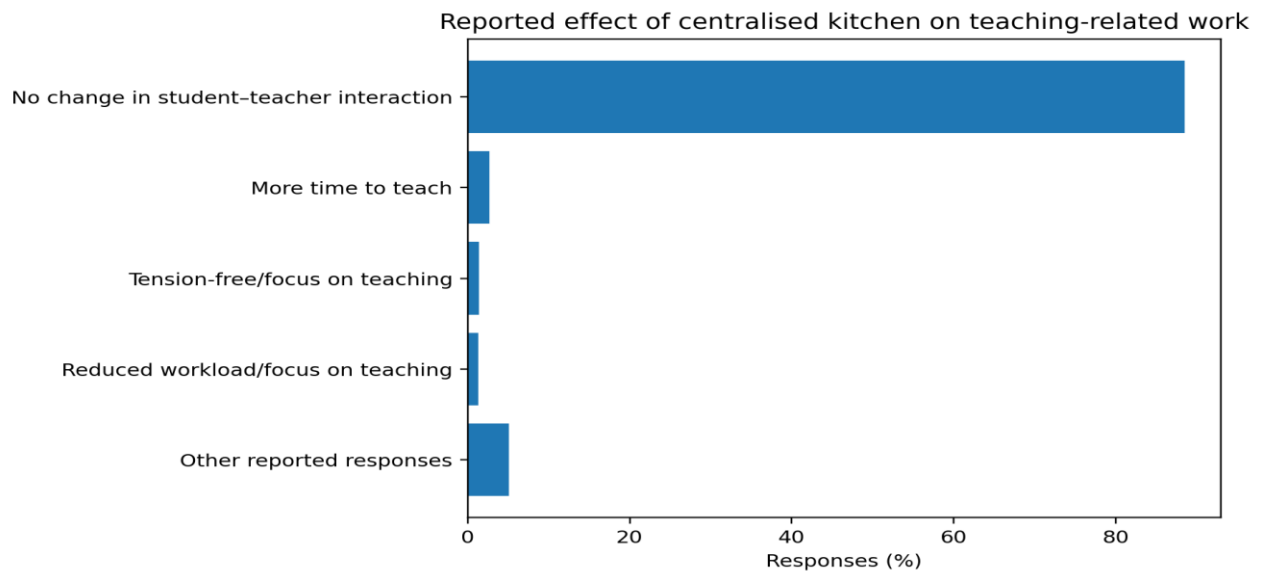


Figure 5: Effect of centralised kitchen on teaching-related work. Source: Primary Source.

The appropriate interpretation is not that every teacher experienced a measurable reduction in workload. Rather, the evidence indicates that centralised delivery removes a recurring administrative and cooking responsibility from

6.6 Overall performance of the seven kitchens

The evaluation used a 200-point grading scale. The seven kitchens scored between 179 and 187

schools and creates the possibility of greater teaching focus. This supports the third hypothesis at the level of perceived institutional effect, while a future study should measure actual teacher time saved.

marks and received grades ranging from C+ to B+. Three kitchens received B+, three received B and one received C+. No kitchen reached the A or A+ category.

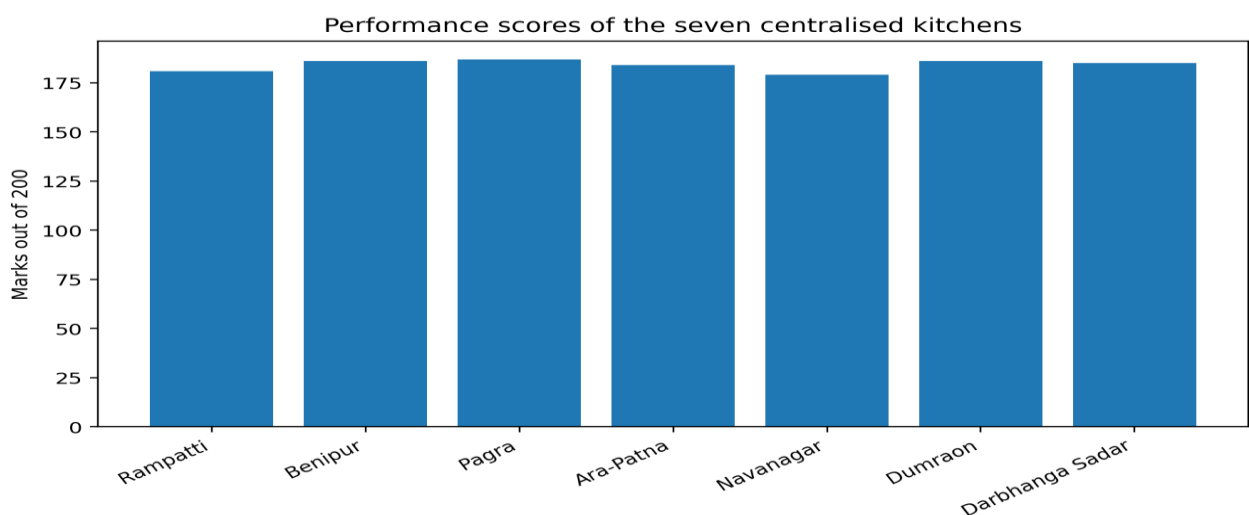


Figure 6: Performance scores of the seven centralised kitchens. Source: Primary Source.

The narrow score range suggests that the kitchens were broadly functional but that none could be described as an outstanding performer

under the evaluation's grading system. The C+ score of the Navanagar kitchen indicates a need

for targeted corrective action rather than a blanket rejection of the centralised model.

7. Discussion

The findings show that centralisation produces a classic trade-off between production efficiency and distribution responsiveness. At the production end, the model offers dedicated infrastructure, staffing and hygiene arrangements. At the school end, however, distance and transport can create time and temperature problems. The policy question is therefore not whether centralisation is good or bad in itself, but where and under what conditions it is efficient.

The evidence also demonstrates that programme utilisation is partly determined by acceptability. The official PM POSHAN framework emphasises a palatable and hygienic meal, and the field evidence shows why this matters. Bad taste was the leading reason for non-consumption among the surveyed non-beneficiary students. Thus, improving nutritional content without improving taste and local acceptability may not increase actual consumption.

The findings are consistent with the wider literature that treats school meals as an educational and welfare intervention. Earlier research found positive associations with attendance and retention, while more recent work reports lower dropout among children who received MDM support. The present evaluation, however, did not find a specific attendance effect attributable to the centralised kitchen arrangement. This difference is not contradictory: the benefit of the school meal programme as a whole should not be equated with the effect of one particular delivery model.

The study therefore supports a differentiated approach. Large clusters of schools with good roads and short travel times may benefit from centralised kitchens. Small schools or schools with poor connectivity may be better served through local cooking. Intermediate locations

could use decentralised satellite kitchens or carefully designed routes.

8. Policy Implications

1. **Supply-area planning:** Define kitchen service areas using distance, road condition, travel time, school size and expected beneficiary load.
2. **Last-mile logistics:** Optimise delivery routes and reduce the preparation-to-consumption interval; explore insulated containers and appropriate holding arrangements where feasible.
3. **Local food preferences:** Use structured student feedback and locally familiar cooks to improve taste while remaining within nutritional norms.
4. **School-level quality assurance:** Maintain tasting registers and introduce rotational tasting by teachers and cooks before serving.
5. **Digital monitoring:** Use random video/remote checks and a simple complaint-resolution mechanism linking schools with kitchen managers.
6. **Hybrid delivery:** Permit school-level cooking for very small schools or locations where transport is not operationally feasible.
7. **School eating infrastructure:** Provide adequate, hygienic eating space so that children do not have to eat in open areas.
8. **Performance-based improvement:** Use kitchen grades to identify specific operational weaknesses rather than as a purely punitive ranking system.

9. Limitations of the Analysis

The study has several limitations. First, it is based on an evaluation covering seven centralised kitchens and 48 schools in four districts; it should therefore not be treated as statistically representative of all PM POSHAN schools in Bihar. Second, the fieldwork covered approximately three months and some schools were closed for a few days because of a cold wave. Third, the evaluation is predominantly descriptive and does not report multivariate or causal statistical tests. Fourth, the present article does not independently measure nutritional intake, calorie/protein consumption or changes

in attendance over time. Finally, some findings are based on stakeholder perceptions, which may differ from independently observed outcomes.

These limitations also define the appropriate interpretation of the hypotheses. The hypotheses are analytically useful propositions, but confirmation requires a larger multi-district sample with school-level panel data, route-time measurements, food-quality testing and inferential statistical analysis.

10. Conclusions

The evaluation of NGO-managed centralised kitchens in Bihar shows that the model has substantial institutional strengths but also important last-mile limitations. Dedicated kitchen infrastructure, staffing and hygiene arrangements provide a foundation for efficient meal preparation. The model can also reduce the involvement of teachers in cooking and meal management, allowing schools to concentrate more strongly on teaching.

The principal challenges arise after cooking. Distance, road connectivity and the reported six-hour interval between preparation and

consumption can reduce temperature and affect acceptability. Taste is especially important: it was the most frequently reported reason for non-consumption among the 106 students who did not eat the meal, while improving food quality and taste was the leading suggestion from headmasters and teachers.

The policy implication is that centralisation should not be pursued as a one-size-fits-all strategy. A flexible system is more appropriate. Centralised kitchens should serve clusters where transport is feasible and timely, while small or poorly connected schools should have access to school-level or other decentralised arrangements. Stronger tasting procedures, local menu adaptation, route optimisation, student feedback and school eating infrastructure can improve the effectiveness of the system.

In short, the success of PM POSHAN depends not merely on producing food but on ensuring that a safe, nutritious, acceptable and timely meal reaches the child. For rural and semi-rural Bihar, the most effective approach is likely to be a context-sensitive combination of centralised efficiency and local responsiveness.

References

- Government of India, Ministry of Education. 2023. Guidelines on PM POSHAN Scheme. New Delhi: Department of School Education and Literacy.
- Gharge, S. and S. Unisa. 2025. Dropout and Retention Among School Children in the Context of the Mid-Day Meal Programme in India. *Journal of the Maharaja Sayajirao University of Baroda*, 18(3–4).
- L. N. Mishra Institute of Economic Development & Social Change, Patna. 2025. Final Evaluation Report: Evaluation of Centralized Kitchens Providing Mid-Day Meal in Bihar. Patna.
- Ministry of Education, Government of India. 2026. PM POSHAN: Pradhan Mantri Poshan Shakti Nirman. New Delhi.
- Paltasingh, T. and P. Bhue. 2022. Efficacy of Mid-Day Meal Scheme in India: Challenges and Policy Concerns. *Indian Journal of Public Administration*, 68(4).
- Samal, J. and R. K. Dehury. 2017. Family Impact Analysis of Mid-day Meal (MDM) Scheme in India with Special Focus on Child Education and Nutrition. *Journal of Health Management*, 19(2).
- Sarma, K. V. R., D. H. Rao, K. Mallikharjuna Rao, C. Galreddy, S. Kumar, V. V. Rao and N. P. Rao. 1995. Impact of Midday Meal Program on Educational and Nutritional Status of School-going Children in Andhra Pradesh, India. *Asia Pacific Journal of Public Health*, 8(1).