Research Article:

MULTIDIMENSIONAL LIVELIHOOD VULNERABILITY AND HOUSEHOLD FOOD SECURITY: A COMPARATIVE ANALYSIS OF URBAN AND PERI-URBAN AREAS OF NEPAL

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ABSTRACT

Urban and peri-urban food security has received wide attention in recent years in the context of rapidly growing internal migration and urbanization in Nepal. This study was conducted to analyze the vulnerability to food insecurity in urban and peri-urban households of Nepal using the Livelihood Vulnerability Index (LVI) framework and the Household Food Insecurity Access Scale (HFIAS). Using a cross-sectional study design, data and information were collected from 435 households during January to March 2023, out of which 288 households were from different clusters of urban areas and 147 households from peri-urban areas of Kathmandu, Dhanusha, and Banke districts. The study found that overall livelihood vulnerability was higher in urban households (LVI = 0.401) than in peri-urban households (LVI = 0.282). Food insecurity, weak social networks, and limited livelihood diversification primarily drove urban vulnerability. Regarding the food security-related component, peri-urban households demonstrated relatively better food sufficiency. The association between LVI and food security categories was statistically significant in relation to urban and peri-urban households, indicating that higher vulnerability corresponds with severe food insecurity. The findings concluded that the public policy and programs need to focus on a location-specific and multidimensional approach to improve food security status and livelihood vulnerability.

Keywords: Agriculture, food access, social network, urbanization

INTRODUCTION

Food security has emerged as a major global concern in efforts to end hunger, poverty, and malnutrition. Ensuring food security has been a continuing priority of the government of Nepal through various policies, plans, and legal provisions (NPC, 2015). Despite planned development and effort, Nepal is one of the vulnerable countries from a food security perspective (Pyakuryal, 2013). Household food insecurity leading to vulnerability is an acute problem in many developing countries like Nepal due to low agricultural productivity, limited livelihood opportunities, inefficient food distribution systems, weak market linkages, poor infrastructure, lack of awareness on healthy food, and inequitable production relations. The situation is more difficult in countries affected by conflict and those in transition (Kaphle et al., 2020).

Rapid urbanization in Nepal has transformed livelihood systems and changed the dynamics of household food security. However, urbanization has increased market dependency, rural-

urban migration, and increased poverty in the informal sector of urban and peri-urban areas, leading to food insecurity (MoALD, 2015). Urbanization has become a global phenomenon, significantly affecting the food system. Urbanization, particularly in developing countries, not only produces economic benefits but also various issues that might lessen people's capacity to afford food (Putra et al., 2020). Wang (2019) reported that rapid urbanization alters the food system, creating major challenges for large populations in China.

Moucheraud et al. (2018), in their study on engagement in agriculture protects against food insecurity and malnutrition in Peri-Urban Nepal, found that households involved in the cultivation of land in peri-urban Bhaktapur had lower food insecurity than non-cultivating households. Likewise, A study conducted in Ethiopia reported that involvement in farming reduced the vulnerability of households to food insecurity (Sileshi et al., 2019). A study conducted in Kenya found that severe food insecurity was highly prevalent with persistent vulnerability in informal urban settlements. This study also highlighted that investing in education among the slum population contributes to food security and livelihood improvement (Mustisya et al., 2016). A study on urban food security and health status of the poor in Dhaka, Bangladesh, revealed that urban vulnerability to food insecurity is largely determined by (gainful) employment (Zingel et al., 2011).

A study conducted in Nepal highlighted that household wealth, marital status, and location significantly influence food security, leading to vulnerability, suggesting targeted policy intervention (Pandey & Fusaro, 2017). A study conducted in Dhanusha district of Nepal found that no major food security status difference was observed between urban–rural areas, except during the post-monsoon season when rural households reported relatively higher food insecurity (Kular et al., 2014). Likewise, Bhandari (2018) studied the regional variation in household food security. His findings showed that food security is basically a problem of rural households. Despite these studies, there is limited literature on comparative evidence on multidimensional livelihood vulnerability between urban and peri-urban households using composite indices such as LVI in Nepal

Nepal is one of the fastest-growing urbanizing countries in the world. Urbanization in Nepal is dominated by a few large and medium cities with excessive population concentration in the city's areas. High urban growth is occurring in the Kathmandu Valley, the Pokhara Valley, the Inner Tarai valleys, and in market and border towns located on highway junctures between the east-west highway and the five main north-south corridors. Urban growth centers are also emerging close to the border with India (MoUD, 2015).

An urban area is a city and can be defined broadly based on population density, concentration of administrative bodies and infrastructure, and a diverse set of livelihood and income generation activities. A peri-urban area refers to transitional zones located between rural and urban core areas, which retain rural characteristics such as substantial reliance on agricultural production, and are generally considered as peri-urban. Peri-urban areas (also referred to as rurban space) are defined as the structure resulting from the process of interface between town and villages or also as the rural-urban transition zone (GoN 2017).

Urban growth is concentrated in the Tarai and mid-Hills regions of Nepal. Comparatively, mountain regions show limited urban expansion due to rugged terrain, low density, and poor road access. Topography affects settlement patterns. Agricultural land loss is a serious consequence of urban expansion. Areas close to large cities have experienced a 3–4% decline in crop production land. Fertile land conversion threatens long-term food security.

Internal migration is a major contributor to urban population growth. People move toward cities seeking education, employment, and services. Remittance income also fuels peri-urban housing development. Migrants frequently settle in peri-urban zones due to lower land prices and housing affordability. These transitional areas experience rapid land-use change. However, infrastructure development does not keep pace with population growth (Bhattarai et al., 2023).

From the very beginning of planned development in Nepal, urban food security related research has historically received limited attention in Nepal, where policy discourse and empirical studies remain largely ruralcentric. National policies and research have traditionally given the priority to rural production and food distribution infrastructure, overlooking the complexities of food access and vulnerability in urban and peri-urban settings (MoALD, 2015). Urbanization in Nepal is rapidly increasing, reshaping rural–urban boundaries, reducing agricultural land, and expanding peri-urban vulnerability. Migration, housing pressure, and livelihood shifts intensify food insecurity in expanding municipalities. These structural transformations highlight rising inequality and declining agricultural dependence in urbanizing regions (CBS, 2021). Urban squatter settlements in Kathmandu face high livelihood vulnerability due to poverty, insecure housing, unemployment, and weak access to services. These conditions force households into fragile coping strategies, increasing food and livelihood insecurity. Migration, lack of skills, and unstable income worsen vulnerability (Baral, 2019).

Household vulnerability to food insecurity in Nepal remains high due to poverty, limited assets, and unequal access to resources. Rural households with large family sizes and high dependency ratios are more exposed to food shortages. Poor infrastructure and weak market access further constrain food availability and economic access, increasing susceptibility to shocks (Regmi et al., 2019).

Despite different studies on food security in Nepal, a research gap remains in capturing multidimensional vulnerability to food security across urban and peri-urban centers. Most existing studies in Nepal focus on the food security status of rural households indicating the need for comprehensive, location-specific study on vulnerability aspect of food security. An understanding of household vulnerability to food insecurity is important for the formulation of policies and strategies to enhance food security and reduce vulnerability to food insecurity among peri-urban and urban households, which this study seeks to address.

RESEARCH METHODS

Research design

A cross-sectional research design was used to conduct a comparative analysis of Multidimensional Livelihood Vulnerability and Household Food Security in Urban and Peri-urban Areas of Nepal as it enables systematic comparison at a specific time. Besides, it efficiently captures socio-economic and multidimensional indicators (LVI and HFIAS), allowing statistical comparison across locations to identify patterns and policy-relevant differences in vulnerability.

Selection of the study area

The study was conducted in three districts of Nepal namely Banke, Kathmandu, and Dhanusha. The districts are selected purposively to include the western, middle and eastern regions of Nepal and also to capture the urban and peri-urban areas. Two municipalities from each district were purposively selected to include the urban and peri-urban areas in the second stage. The local level with highest population density, concentration of administrative bodies & infrastructure and with metropolitan or sub-metropolitan status were selected as urban area and the local level

with lower concentration of administrative bodies & infrastructure with status of municipality were selected as peri-urban area for the study.

All the households of the selected local levels constituted the study population. Cluster sampling was done in the third stage to identify the clusters inside the local level. There were all together 12 clusters, 2 from each local levels. The clusters within the urban area included slum areas, temporary migrants and working-class people in the selected local level. The clusters within the peri-urban area included households having significant agricultural production activities as a source of livelihood in the selected local levels. In the fourth stage, simple random sampling was employed to select the households within each cluster under urban and peri-urban areas.

Sample size

The formula given by Cochran (1963) was employed to estimate the sample size for this

$$n = \frac{Z^2 \cdot p \cdot q}{e^2}$$

Here, n is the required sample size, Z is the Z-value giving the desired confidence level, p is the estimated population proportion with the characteristic, and e is the margin of error. Since most of the population in selected areas is heterogeneous in livelihood vulnerability and food security across diverse socio-economic settings, this formula is appropriate for determining the sample size supporting the application of inferential statistics, enhancing the validity and generalizability of findings within selected urban and peri-urban areas. Keeping these points in view, a 95% confidence level with a population proportion of 0.5 and a margin of error of 0.05 was chosen to ensure reliable sample size. The sample size was then calculated as follows:

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} \approx 385$$

A non-response rate of 10% was considered while determining the final sample size. Therefore, the initially calculated sample size was increased to 435 to compensate for possible non-responses

From the calculation, the final sample size comprised 435 households out of which 288 households were from different clusters of urban areas and 147 households from peri-urban areas. The unequal sample size in urban and peri-urban areas is due to the different settlement patterns and household concentration. Urban areas have dense households and greater heterogeneity, requiring larger samples for accurate representation, whereas peri-urban areas are less dense with relatively homogeneous characteristics, justifying a comparatively smaller sample size.
The data and information were collected during January to March 2023 using a semi-structured interview schedule.

Analytical techniques

Descriptive statistics were used to summarize the vulnerability indicators and food security status. Independent sample *t*-tests were used to assess mean differences, while the chi-square test was used to examine the associations between categorical variables to determine significant differences between urban and peri-urban households ($p < 0.05$). In this regard, the Statistical Package for the Social Sciences (SPSS) and STATA Statistical Software were used for data analysis.

Food security status was assessed using the Household Food Insecurity Access Scale (HFIAS). Food security status was categorized into food secure, mildly insecure, moderately insecure,

and severely insecure households using standard HFIAS scoring procedures. Mean scores and severity distribution were compared between urban and peri-urban areas.

Household vulnerability was assessed using the Livelihood Vulnerability Index (LVI) framework, which includes the major components: socio-demographic profile, livelihood strategies, social networks, food, water, and exposure to natural disasters. The LVI is calculated using a balanced weighted average approach, in which each sub-component contributes equally to the overall index, despite differences in the number of sub-components within each major component. The formula applies equal weighting to all major components using a simple aggregation method Each component covered multiple sub-indicators normalized between 0 and 1. Component indices were averaged to derive the overall LVI for urban and peri-urban households (Hahn et al., 2009).

$$Index_{sd} = \frac{S_d - S_{min}}{S_{max} - S_{min}}$$

where S_d denotes the observed value of sub-components for the area d, and S_{min} and S_{max} represent the theoretical or observed minimum and maximum values, respectively.
Subsequently, the indexed sub-components within each major component were aggregated by calculating their arithmetic mean:

$$M_d = \frac{\sum_{i=1}^{n} Inde\, x_{sd}}{n}$$

Where n denotes the number of sub-components in each major component.
Finally, the overall LVI was calculated as a weighted average of the six major component indices:

$$LVI_d = \frac{\sum_{i=1}^{6} W_i\, M_{di}}{\sum_{i=1}^{6} W_i}$$

Higher LVI scores indicate greater livelihood vulnerability.

RESULTS AND DISCUSSION

Urban and peri-urban livelihood vulnerability index

Sub-components values of livelihood vulnerability index for urban and peri-urban households covering the major six components: socio-demographic profiles, livelihood strategies, social networks, food access, water availability, and exposure to natural disaster are presented in Table 1. Overall, the result indicates greater structural vulnerability to food insecurity in urban households whereas peri-urban households exhibited the vulnerability related to agriculture and natural disaster. Likewise, a study by Rana et al. (2017) also reported that peri-urban agriculture in the Kathmandu Valley plays a key role in local food supply and livelihoods, but rapid urbanization and land conversion are increasing farmers' vulnerability. Many traditional farmers are shifting to uncertain livelihood patterns, weakening long-term food security and exposing peri-urban communities to greater risks of food insecurity

Sociodemographic profile reveals a higher proportion of female headed household (29.93%) and dependent population in peri-urban households whereas, urban households had higher level of non-school attainment and disadvantaged ethnicity representation. Permanent residency was comparatively lower (12.24%) in peri-urban area. Regarding livelihood strategies, Peri-urban households depended more on agriculture, livestock ownership and had more diversified income source having higher proportion of foreign income and credit facilities. Social network dimension shows that compared to peri-urban households, urban households had weaker social network with higher proportion lacking organizational membership, training access and

external support during shocks. Food security indicators reveal that food sufficiency situation in urban household was poor as nearly all of the households (99.65%) lack year-round food sufficiency and majority also lack food storage. Conversely, peri-urban households had better food sufficiency and food storage. However, the finding is contradictory to the study conducted by Graham et al. (2024) where higher community urbanicity is significantly associated with reduced household food insecurity and about 18% lower likelihood of food insecurity in more urbanized settings, reflecting improved food access, infrastructure, and livelihood opportunities. Regarding water access, irrigation and drinking water facilities were comparatively better in peri-urban areas under natural disaster component, peri-urban households experienced higher natural disaster such as drought, landslide, and crop loss during harvest.

Table 1. Sub-components value of livelihood vulnerability index

Major Component	Sub-Component	Urban (%)	Peri-urban (%)
Socio-demographic Profile			
	Female headed household	20.49	29.93
	Household head not attain school	82.99	57.82
	Ethnicity of household head (Disadvantage group)	22.92	15.65
	Percent of people residing in permanent address	45.14	12.24
	Dependent Population in Family	3.84	3.89
Livelihood Strategies			
	Household major source of income agriculture	7.99	30.61
	Household don't have income more than one source	74.61	14.97
	Household don't have off farm income	0	6.8
	Household own livestock's	10.42	42.18
	Household don't have foreign income	84.03	75.51
	Household don't have access to credit	59.03	5.44
Social Networks			
	Household who doesn't have membership organization	69.79	15.65
	Household who hasn't received training	91.67	27.21
	Household who hasn't received support during socks	40.42	13.48
Food			
	Household who doesn't have sufficient food for 12 months	99.65	74.83
	Household who doesn't have any storage of food during survey period	74.31	7.48
	Household increasing expenditure in food last three years	69.44	77.55
	Household took loan for food during insufficiency	9.03	30.61
Water			
	Household don't have irrigation facilities	63.19	26.53
	Unirrigated land out of total land	13.98	2.45
	Household don't have access to drinking water	7.99	0.68
Natural Disasters			
	Household left cultivation due to drought	0.69	1.36
	Household cultivated land destroyed by landslide	0	10.88
	Household experience loss during harvest	0.69	68.71

Table 2 shows the indexed score for each vulnerability subcomponents and major components and the overall LVI value for urban and peri-urban households. The overall LVI score indicates that there was the higher level of vulnerability in urban households (0.401) compared to peri-urban households (0.282). This result reveals that there was higher multidimensional vulnerability in the urban setting as compared to peri-urban. The statistically significant differences across all components confirm that vulnerability patterns are location-specific and multidimensional. This result contrasts with the conventional assumption that rural and peri-urban households are comparatively more vulnerable. However, Similar findings have been reported in urban informal settlements in Bangladesh and India, where food insecurity and weak social networks cause vulnerability despite market accessible (Ruel et al., 2017). Similarly, a contradictory result was found in South Africa, as rural households are comparatively more vulnerable to food insecurity than urban households (Mthethwa & Wale, 2021).

Among the major components, the sociodemographic index is significantly higher in urban households (0.494) than in peri-urban households (0.373), reflecting educational disadvantage and a disadvantaged ethnic composition. The livelihood strategies index was found to be higher in urban households (0.345) due to limited income sources, low level of foreign income and poor credit access. Similarly, urban households showed a higher level of vulnerability in social network (0.650), especially due to limited organizational membership and low access to training. Regarding the food security-related component, higher level of vulnerability was found in urban households (0.631) than in peri-urban (0.476) specially in food sufficiency and storage. Vulnerability related to water accessibility higher in urban households (0.283) compared to urban households (0.102). Interestingly, vulnerability due to natural disaster was higher in peri-urban setting (0.269) due to drought, harvest loss and landslides.

Table 2. Indexed sub-component, major components and overall LVI for peri-urban and urban

Major Component	Sub-Component	Urban	Peri-urban	T-value
Socio-demographic Profile		0.494	0.373	7.508***
	Female-headed household	0.210	0.300	
	Household head not attending school	0.830	0.570	
	Household head from Disadvantage ethnicity	0.760	0.510	
	Permanent resident household	0.450	0.120	
	Dependent Population	0.405	0.413	
Livelihood Strategies		0.345	0.287	3.642***
	Agriculture as major source of income	0.080	0.310	
	Household with single income source	0.740	0.140	
	Household without off farm income	0.000	0.068	
	Household that owns livestock	0.110	0.420	
	Household with no foreign income	0.840	0.760	
	Household don't have access to credit	0.310	0.030	
Social Networks		0.650	0.184	21.445***
	Household without organization membership	0.700	0.160	
	Household not receiving any training	0.910	0.270	
	No support during socks	0.340	0.120	
Food		0.631	0.476	8.414***
	No sufficient food for 12 months	0.990	0.750	
	No food storage during survey period	0.740	0.075	
	Increase food expenditure in last three years	0.690	0.780	
	Loan taken for food	0.090	0.300	
Water		0.283	0.099	10.472***
	No irrigation facilities	0.630	0.270	
	Unirrigated land	0.140	0.030	
	No access to drinking water	0.080	0.006	
Natural Disasters		0.004	0.269	-29.520***
	Left cultivation due to drought	0.006	0.014	
	Household suffered by landslide	0.000	0.108	
	Loss during harvest	0.006	0.687	
	Overall LVI			14.75***
	Urban	0.401		
	Peri-Urban	0.282		

*** indicates 1% levels of significance

Multidimensional comparison of the major components of the livelihood vulnerability index

Fig. 1 provides information on multidimensional comparison of the major components of the livelihood vulnerability index between urban and peri-urban households. Each axis in the figure represents vulnerability components such as socio-demographic profile, livelihood strategies, social network, food, water access and natural disaster. The radial distance from the center indicates the magnitude of vulnerability. The figure clearly reveals that urban household showed higher vulnerability score in several key components compared to peri-urban households. The urban vulnerability was mostly driven by food insecurity, weak social network and limited

livelihood strategies whereas peri-urban vulnerability was mostly agricultural and natural disaster related. This finding is consistent with the Mozambique LVI study, where food, social capital, and adaptive capacity strongly influenced vulnerability outcomes (Hahn et al., 2008).

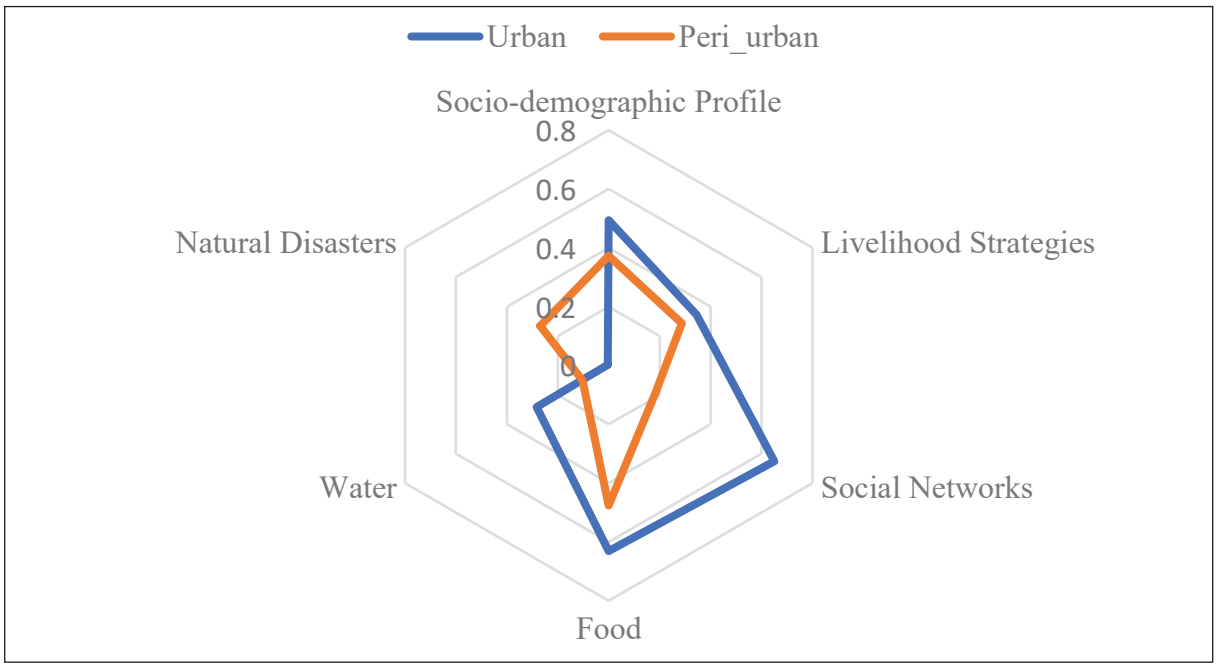

Fig. 1. Vulnerability spider diagram of the major components of the livelihood vulnerability index

Livelihood vulnerability to food security category

The integration of LVI score with HFIAS-based food security category in urban and peri-urban households was shown in Fig. 2. The result shows that the livelihood vulnerability index in terms of food security category was higher in urban households. The finding also reveals that increasing food insecurity corresponds to livelihood vulnerability.

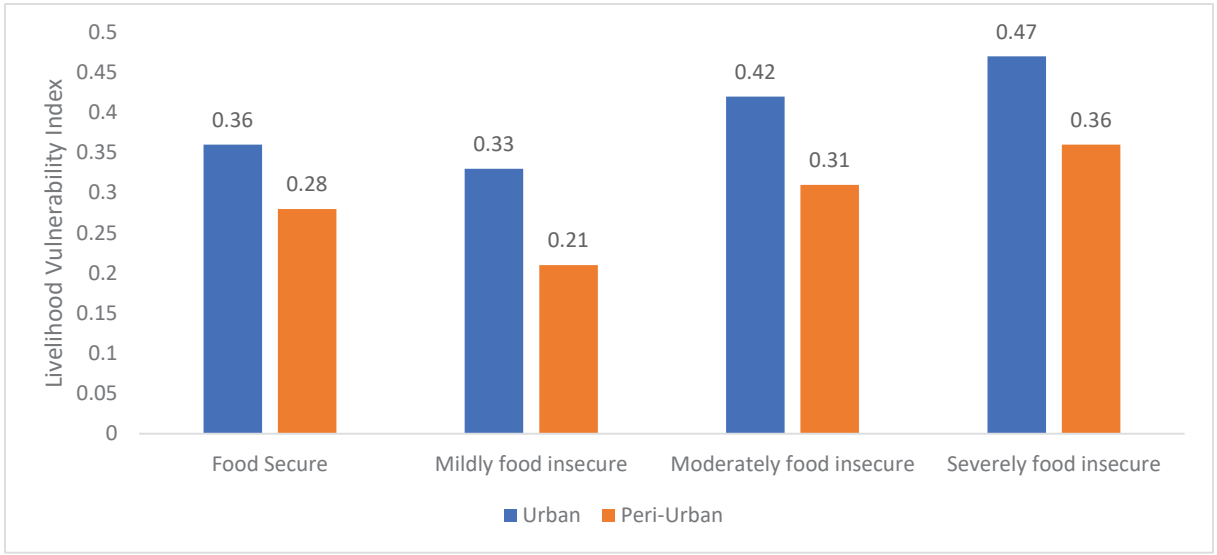

Fig. 2. Livelihood vulnerability index in terms of food security category

Fig. 3 shows the comparative bar chart of overall livelihood vulnerability score for urban and peri-urban households. The bar diagram clearly indicates that urban households were in comparatively more livelihood vulnerable situation. The graphical difference aligns with the

statistically significant result. The statistically significant mean difference (t-value 14.75; $p < 0.001$) further support the observed difference of livelihood vulnerability index between urban and peri-urban households. A study in rural South Africa showed the similar finding that there was a significant association between livelihood vulnerability and food insecurity severity as vulnerable households were significantly more likely to experienced chronic food insecurity (Mthethwa, 2021)

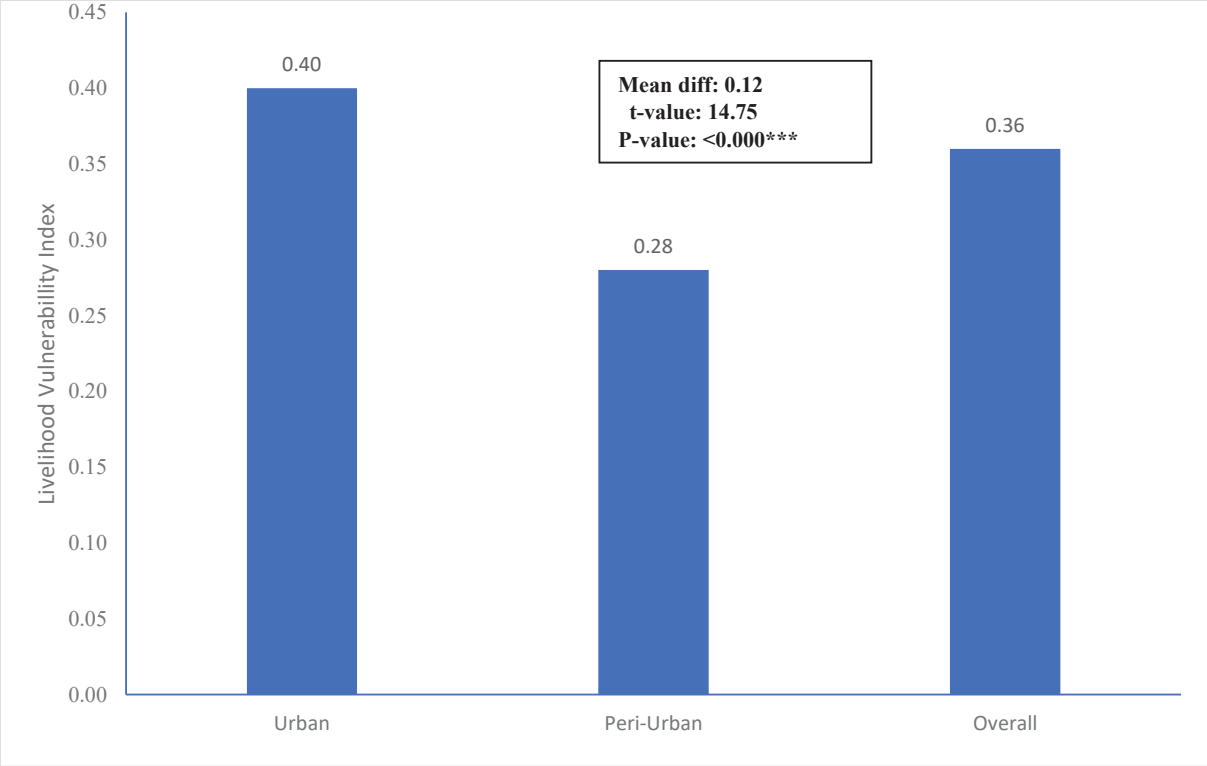

Fig. 3. Comparative bar chart of overall livelihood vulnerability index

CONCLUSION

Overall finding of the study revealed that livelihood vulnerability and household food security differ substantially between urban and peri-urban households. Overall livelihood vulnerability was higher in urban households especially due to food insecurity, weak social networks and limited livelihood diversification. The proportion of households with food insecurity was also higher in urban areas due to limited food availability, weak food storage, increasing trend of food expenditure and limited options for income diversification. The association between LVI and food security categories was statistically significant which indicates that multidimensional vulnerability directly influences food security severity. The finding implies that public policies and programs need to reconsider urban poor households to improve their food security. Finally, urban households in the study area need to be strengthened through improved food access system, social networking with safety nets and livelihood diversification programs. Likewise, peri-urban households require climate-resilient agricultural practices to minimize disaster related vulnerability.

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AUTHOR CONTRIBUTIONS

BDK: Conceptualization, Methodology, Formal analysis, Writing – original draft; **PPR:** Visualization, Writing – review & editing, Supervision; **SCD:** Visualization, Writing – review & editing, Supervision; **DG:** Visualization, Writing – review & editing, Supervision.

CONFLICT OF 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.

ETHICAL APPROVAL AND PERMITS

Since this study was based on voluntary participation of respondents through semi-structured interviews, and did not involve any experimental intervention, no formal ethical approval was taken. However, informed consent was obtained from all participants, and confidentiality of their responses were maintained.

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