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Claws and consequences: human–tiger conflict and community responses in Bardiya National Park, Nepal

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Human–tiger conflict (HTC) is one of the rising issues of Bardiya National Park (BNP) and is receiving attention from conservation biologists. This study emphasizes the extent of human–tiger conflict in two municipalities, Thakurbaba and Madhuban, in the buffer zone of Bardiya National Park, Nepal. Primary and secondary information was collected to determine the socio-economic characteristics relevant to tiger conservation following a questionnaire survey of the community people. A semi-structured questionnaire was randomly administered to 438 households to generate information from the respondents, along with these people's perceptions toward tigers and their interest in tiger conservation. The Likert scale was used to assess respondents' attitudes, while a chi-square test of homogeneity and logistic regression analysis were employed to determine the best-fitting model and identify significant variables influencing perceptions toward tiger conservation. A total of 18 people were killed and 10 were injured by tigers between 2019 and 2023. The people's perception of tigers and their conservation was significantly associated with socio-economic variables, including gender, ethnicity, economic status, and source of income. We found female, low-income, and Janajati respondents likely to have negative attitudes toward their conservation. The Likert scale responses revealed strong overall support for tiger conservation and perceived tourism benefits. In addition to the ever-growing human–tiger conflict, people are aware of tiger conservation and suggest that making net wire fences, providing improved sheds for cattle, and cattle insurance schemes help to minimize Livestock depredation events; effective training on wildlife monitoring and awareness programs could be among the best ways to mitigate conflicts between humans and tigers.

KEYWORDS

conservation, human-tiger conflict, people's perception, socio-economic, Panthera tigris

1 Introduction

Large carnivores, despite occurring in lower densities (Karanth and Chellam, 2009), are highly involved in conflicts with humans, which reduces carnivore populations through active persecution based on real or perceived threats to themselves or their livestock (Graham et al., 2005; Inskip and Zimmermann, 2009; Goodrich et al., 2011). Human–wildlife conflict (HWC) has been one of the most significant conservation issues in recent years, exacerbated by increasing human populations, loss of natural habitats, and, in some cases, increased wildlife populations due to successful conservation programs (Sethy, 2013). Human–tiger conflict (HTC) is generally expressed in four forms: i) tiger attacks on humans, ii) tiger attacks on livestock, iii) threats to human safety from tigers living near human settlements, and iv) retaliatory killings of tigers (Goodrich, 2010; Bhattarai et al., 2019).

Two decades of conservation success in Nepal have led to a rapid increase in the tiger population (DNPWC and DFSC, 2022). The tiger population in Nepal was estimated at 121 individuals in 2009 (Karki et al., 2009), 198 in 2013 (Dhakal et al., 2014), 235 in 2018 (DNPWC and DFSC, 2018), and 355 in 2022 (DNPWC and DFSC, 2022), indicating an almost tripling of the population between 2009 and 2022. In recent years, there has been an increase in reported incidences of HTC. These incidents typically involve the depredation of livestock and attacks on humans trespassing into the park area or in the fringe area for the forest resources (Bhattarai and Fischer, 2014; Dhungana et al., 2022; Gurung et al., 2008; Paudel et al., 2024). Additionally, incidents of tiger mortalities arising from territorial disputes among male tigers have been reported in national parks (Bhatt et al., 2023; Kadariya et al., 2023).

In Nepal, Bardiya National Park (BNP), home to 125 tigers (DNPWC and DFSC, 2022), is ecologically connected to Banke National Park (BaNP) in the east, which harbors 25 tigers (DNPWC and DFSC, 2022). It is also connected to India's Katarniaghat Wildlife Sanctuary (KWS) in the south with 59 tigers (Qureshi et al., 2023) through the Khata forest corridor, which forms one of the priority Tiger Conservation Landscapes of the Indian Subcontinent (Wikramanayake et al., 1998). As Nepal's second-largest national park with an increasing tiger population (DNPWC and DFSC, 2022), BNP serves as the source population for the surrounding landscapes of Nepal and India (Sanderson et al., 2010).

Protected areas (PAs) cover 23.39% of the total land (DNPWC, 2022), where a high density of local communities dependent on natural resources live alongside PAs (Heinen et al., 2019), particularly in Nepal's plains. BNP also has a high human population density (Government of Nepal, 2022). Along with the increasing tiger population, HTC is also on the rise in BNP and its associated forests (Kadariya et al., 2023). In the decade leading up to 2019, there were no human fatalities related to HTC—an important element of conservation success in the Bardiya region (Fitzmaurice et al., 2021). However, between September 2020 and May 2021, there were approximately 10 human fatalities due to tiger attacks within BNP (Rauniyar, 2021). According to park authorities, 12 people were killed in the park region during the fiscal year 2021/2022 (DNPWC, 2022). Community people who have benefited from PAs are active in management initiatives, are less reliant on natural resources, and are more likely to have a positive attitude toward tiger conservation (Dewu and Røskaft, 2018; Karanth and Nepal, 2012; Mutanga et al., 2015). Conversely, higher livestock losses, greater reliance on natural resources, and incidents of human attacks lead to negative attitudes toward tigers and their conservation among local people (Baral and Heinen, 2007; Mutanga et al., 2015). Such attitudes and retaliatory killings can seriously undermine conservation efforts (Aryal et al., 2015; Carter et al., 2014; Singh et al., 2015). Although all countries are affected by HWC, developing countries like Nepal are more vulnerable than developed nations since livestock and agriculture are important parts of rural livelihood (Khanal et al., 2022; Luitel, 1999).

In addition to a scientific understanding of wildlife conflicts, the attitudes of local people toward wildlife are critical for managing the conflict (Naughton-Treves and Treves, 2005). To ensure that wildlife management policies are effective and sensitive to local conditions, it is important to understand social factors, such as the attitudes of local people, which provide an overview of the cultural and sociopolitical context of human–wildlife conflicts (Kideghesho et al., 2007). Assessing local people's attitudes can provide insight into how they will behave, how they comply with wildlife protection regulations, how they respond to economic losses caused by wildlife, and the degree to which they are willing to coexist with wildlife (Megaze et al., 2017).

This study investigates the socio-economic factors influencing local attitudes toward tigers and their conservation in the buffer zone of BNP, Nepal. By identifying key variables associated with positive or negative perceptions, the research aims to inform targeted conservation strategies that promote coexistence, reduce conflict, and support long-term tiger population sustainability.

2 Methods

2.1 Study area

The study was carried out in two municipalities in the buffer zone of BNP, Thakurbaba and Madhuban, in mid-western Nepal. Thakurbaba municipality covers an area of approximately 104.5 km^2, while Madhuban municipality spans approximately 135.1 km^2. BNP (28°23′N 81°30′E), with an area of 968 km^2, is the largest protected area in the Terai region of Nepal, listed in Terai Arc Landscape (TAL) (BNP, 2022; Wikramanayake et al., 1998). The landscape of the study area spans from 152 m at Manaughat to 1,564 m at Baspani above mean sea level, predominantly characterized by flat lowlands. The vegetation cover within BNP and its buffer zone is primarily composed of forests (76%), followed by cultivated land (13.48%), shrubland (3.64%), sandy areas (3.42%), water bodies (1.63%), grasslands (1.47%), barren land (0.16%), swampy areas (0.15%), orchards (0.02%), and river cuttings/cliffs (0.01%) (BNP, 2022). The area falls within two bioclimatic zones—the lower tropical zone (below 500 m) and the higher tropical zone (501–1,564 m)—experiencing a subtropical

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TABLE 1 Specific question for respondents n = 438 (attitudes toward the tiger conservation).

Questions	Structured replies	Score	Response (%)
Should tigers be conserved?	Strongly agree	5	45
	Agree	4	37
	Neutral	3	15
	Disagree	2	3
	Strongly disagree	1	0
Is tourism increasing because of tigers?	Strongly agree	5	22
	Agree	4	45
	Neutral	3	20
	Disagree	2	8
	Strongly disagree	1	5
Are both conflict and the number of wildlife increasing?	Strongly agree	5	4
	Agree	4	6
	Neutral	3	18
	Disagree	2	51
	Strongly disagree	1	20
Are you happy with the increasing tiger population?	Strongly agree	5	0
	Agree	4	3
	Neutral	3	21
	Disagree	2	27
	Strongly disagree	1	49
Are you satisfied with the park management and compensation?	Strongly agree	5	39
	Agree	4	29
	Neutral	3	19
	Disagree	2	11
	Strongly disagree	1	2

monsoon climate characterized by four distinct seasons: summer (March–May), monsoon (June–August), autumn (September–November), and winter (December–February) (Odden and Wegge, 2005).

Rich in biodiversity, BNP harbors 839 species of flora and numerous endangered large mammals such as the Asian elephant (*Elephas maximus*), greater one-horned rhinoceros (*Rhinoceros unicornis*), and tigers, alongside a total of 61 mammalian species, 513 bird species, 52 herpetofauna species, and 121 fish species (BNP, 2022). The buffer zone is inhabited by a diverse population, including Indigenous communities like the *Tharu*, as well as *Brahmin*, *Chhetri*, and *Thakuri*, and *Dalit*, who reside in economically disadvantaged conditions (National Statistics Office, 2021). The human population density in Thakurbaba municipality is approximately 473 persons per square kilometer, with a total of 11,469 households. Similarly, Madhuban municipality has 391 persons per square kilometer, with 12,444 households (Central Bureau of Statistics, 2022). The local economy is almost completely based on farming with extensive irrigation systems (Prins et al., 2022). The western section of BNP has been characterized by relatively high densities of both natural prey and livestock (Upadhyaya et al., 2020).

2.2 Data collection method

A semi-structured questionnaire survey was used to obtain data on people's perceptions of tigers and their interest in tiger conservation (Supplementary Material 1). In total, 438 household surveys (168 Thakurbaba and 270 Madhuban) were included. Interviews were conducted primarily with the head of the household, although other family members often participated to formulate a collective response. In the absence of the head of the family, another family member who is over 18 was interviewed. All questions were closed-ended for ease of quantitative analyses. Interviews were conducted in participants' homes in January and February 2022, and each interview lasted 30–45 minutes.

Data on human casualties and injuries (2019–2023) because of HTC were retrieved from BNP and the National Trust for Nature Conservation (NTNC). Secondary data were also collected through a comprehensive review of various sources, including published and unpublished literature, books, articles, annual reports, and relevant online websites.

2.3 Data analysis

We collected both quantitative and qualitative data from the study sites. We performed chi-square tests to find any significant difference in the local community's attitudes toward tigers and their conservation with socio-economic variables like gender, age, ethnicity, source of income, economic status, and landholding size.

To examine attitudes, we formulated five structured questions (Table 1). We used a 5-point Likert-type ordinal scale (coded as 1, 2, 3, 4, or 5) to assess the attitudes of the community people (Likert, 1932; Spiteri and Nepalz, 2006), with responses coded as follows: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree toward tiger conservation. To further investigate the factors influencing community interest in tiger conservation, we employed a binary logistic regression model, as the dependent variable, "interests in tiger conservation", was recoded into a binary format (0 = not interested, 1 = interested). This approach allowed for the estimation of unbiased and efficient coefficients for the explanatory variables. The model included ethnicity, gender, age group, education, source of income, and the ability to differentiate tigers from leopards (yes/no) as independent variables. We performed all the statistical analyses using R (R Core Team, 2022).

3 Results

3.1 Socio-economic characteristics

We surveyed a total of 438 households in Madhuban and Thakurbaba municipalities, which are two of the five municipalities in the buffer zone of Bardiya National Park (Figure 1). The majority of the respondents were male [70% (n = 305)], while only 30% (n = 133) were female. Similarly, the age group of between 41 and 60 years accounted for the largest portion of the survey respondents [43% (n = 189)], followed by the 20–40 years age group with 38% (n = 167), 61–80 years with 18% (n = 78), and above 80 years with only 1% (n = 4). Most respondents were Tharu [54% (n = 235)], as they have a high population density within the study area, followed by Brahmin, Chhetri, and Thakuri (BCT) [32% (n = 140)] and Dalit [14% (n = 63)]. The majority of the respondents were literate [32% (n = 142)], with 32% (n = 139) having passed the School Leaving Certificate (SLC)/Secondary Education Examination (SEE) and 11% (n = 49) having completed the intermediate level. The remaining 25% (n = 108) were illiterate. The primary occupation of respondents was daily wage labor, accounting for 51% (n = 223) of the total surveyed population. This included employment as drivers, tourist guides, kitchen helpers, and cooks in hotels. Agriculture was the second most common livelihood, involving 32% (n = 140) of respondents. A small proportion of individuals [3% (n = 11)] operated their own business, such as homestays and restaurants, and 3% (n = 11) were engaged in foreign employment, contributing to household income through remittances. Government employment was reported by 8% (n = 37). The remaining 4% (n = 16) were involved in rearing animals, with cows, buffalos, goats, hens, and oxen as the major livestock reared by the people of the study area. Similarly, 64% (n = 279) of the respondents had taxable land, while 36% (n = 159) had non-taxable land for agricultural activities.

3.2 Human–tiger conflict

Over 5 years (2019–2023), a total of 18 people were killed and 10 people were injured by tigers (Table 2). The study area recorded several incidents of livestock depredation caused by tigers. Livestock depredation incidents totaled 198, including 116 buffalos, 32 goats, 29 cows/oxen, and 21 sheep killed by tigers in Madhuban and Thakurbaba municipalities (Figure 2).

3.3 People's attitudes/perceptions toward tiger conservation

The results of the study revealed that the majority of the respondents [71% (n = 313)] had a positive attitude toward tiger conservation. A significantly higher percentage of men [70% (n = 305)] were interested in tiger conservation compared with women [30% (n = 133)] ($\chi^2 = 7.05$, df = 1, $p < 0.05$) (Table 3). This could be because men are more involved in conservation programs, community organizations, and wildlife-related professions,

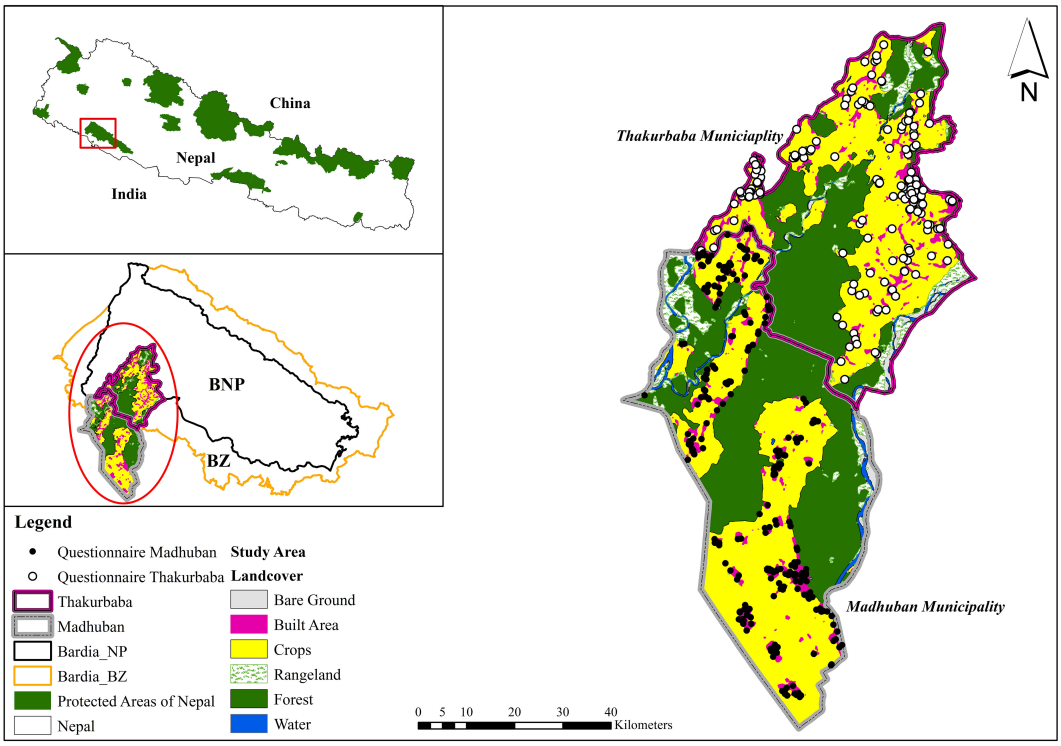

FIGURE 1
Map of the study area showing respondents' locations and land use/land cover (LULC) classification within the study area in 2022.

TABLE 2 Humans killed/injured by tigers.

Municipality	Year	Killed	Injured
Thakurbaba	2019	1	0
	2020	0	3
	2021	1	0
	2022	1	0
Madhuban	2020	6	2
	2021	3	0
	2022	2	2
	2023	4	3
Total		18	10

whereas women are more likely to visit forests for daily necessities. The study also found a positive relationship between the respondents' ethnicity and their attitudes toward tiger conservation (χ^2 = 10.24, df = 2, $p < 0.05$) (Table 3), as most of the people belonging to the *Tharu* ethnic group, who are engaged in the conservation sector, benefit from tiger ecotourism. Similarly, the study revealed that the respondents' source of income (χ^2 = 15.71, df = 5, $p < 0.05$) and their economic status also positively influence the attitudes toward tiger conservation (χ^2 = 9.81, df = 3, $p < 0.05$) (Table 3), as tiger ecotourism has the potential to provide a sustainable income for many local people in the future.

To assess attitudes of the community people, five Likert scale questions were posed to respondents (n = 438) regarding various aspects of tiger conservation (Table 1). The majority of the respondents expressed strong support for tiger conservation, with 45% strongly agreeing and 37% agreeing that tigers should be protected. Additionally, 67% (22% strongly agree and 45% agree) believed that tourism has increased due to the presence of tigers. However, attitudes were more mixed regarding human–wildlife conflict and park management. Only 10% acknowledged that both wildlife and conflict are increasing, while a large portion either disagreed (51%) or strongly disagreed (20%) with this statement. Respondents were also divided in their views on the rising tiger population: 76% expressed negative sentiments, with only 3% agreeing and none strongly agreeing. On park management and relief mechanism, responses were generally positive, with 68% reporting satisfaction.

Table 4 shows that livelihood vulnerability led to negative attitudes. Respondents involved in animal husbandry exhibited the strongest negative attitudes ($\beta = -1.97$, $p < 0.05$), followed by daily wage laborers ($\beta = -0.66$, $p < 0.05$). Similarly, ethnicity significantly influenced attitudes, with Janajati (predominantly *Tharu*) showing reduced support compared to the BCT reference group ($\beta = -0.62$, $p < 0.05$). Gender disparities emerged, with men more supportive than women ($\beta = 0.47$, $p = 0.05$). Conversely, ecological knowledge—the ability to differentiate tigers from leopards—strengthened support ($\beta = 0.59$, $p < 0.05$).

3.4 Control measures

This study found that a large percentage of respondents [74% (n = 324)] do not have a predator-proof corral house, and only a few [26% (n = 114)] had a predator-proof house (χ^2 = 100.68, df = 1, $p < 0.05$). The community members tended to keep their livestock in open fields. Moreover, 65% (n = 285) of respondents believed that everyone was responsible for tiger conservation, 22% (n = 96) believed that park officials were responsible, 11% (n = 48) believed that the government was responsible, and 2% (n = 9) believed that the local community was responsible (χ^2 = 409.73, df = 3, $p < 0.05$). Additionally, 62% (n = 270) were dependent on the community forest for livestock fodder, 23% (n = 101) were dependent on the

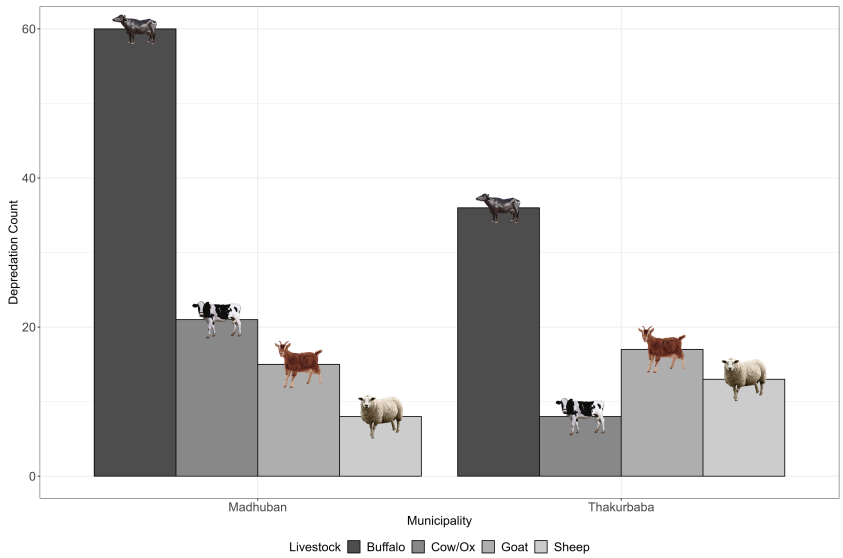

FIGURE 2
Livestock depredation caused by tigers in Thakurbaba and Madhuban municipalities between 2017 and 2022.

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TABLE 3 Socio-economic characteristics of respondents (interested in tiger conservation).

Variable	Category	Interested in tiger conservation		N	%	χ^2	df	p-Value
		No	Yes					
Gender	Male	75	230	305	70%	7.0548	1	0.00791**
	Female	50	83	133	30%			
Ethnicity	BCT	31	109	140	32%	10.244	2	0.005963**
	Janajati	82	153	235	54%			
	Dalit	12	51	63	14%			
Age group	20–40	51	116	167	38%	0.78895	3	0.8521
	41–60	50	139	189	43%			
	61–80	23	55	78	18%			
	>80	1	3	4	1%			
Education	Illiterate	32	76	108	25%	0.16908	3	0.9824
	Literate	41	101	142	32%			
	SLC/SEE	38	101	139	32%			
	>Grade 12	14	35	49	11%			
Settlement	<5 years	4	9	13	3%	2.8498	3	0.4154
	5–20 years	14	34	48	11%			
	21–50 years	67	193	260	59%			
	>50 years	40	77	117	27%			
Economic Status	Low economic status	24	63	87	20%	9.8082	3	0.02027**
	Lower middle economic status	78	151	229	52%			
	Middle economic status	19	89	108	25%			
	High economic status	4	10	14	3%			
Source of income	Agriculture	26	114	140	32%	15.705	5	0.007739**
	Animal husbandry	9	7	16	4%			
	Business	4	7	11	3%			
	Foreign employment	2	9	11	3%			
	Government job	11	26	37	8%			
	Work on daily wages	73	150	223	51%			
Taxable land (katha)	<10	68	142	210	75	2.814	1	0.093
	>10	15	54	69	25			
Non-taxable land (katha)	<10	62	91	153	96	0.124	1	0.725
	>10	2	4	6	4			

BCT, Brahmin, Chhetri, and Thakuri; N, total number; χ^2, chi-square; df, degree of freedom; SLC, School Leaving Certificate.
**Significant at $p < 0.05$.

national park, and only 15% (n = 67) of the respondents were using their private land for fodder collection for the livestock. Respondents recommended various measures to control livestock depredation, including making net wire fences [68% (n = 268)], providing improved sheds for cattle [23% (n = 91)], managing grazing for cattle [3% (n = 13)], offering cattle insurance [4% (n = 17)], and keeping dogs in the house [2% (n = 6)] ($\chi^2 = 625.24$, df = 4, $p < 0.05$) (Figure 3).

The results of our study indicate that most people believe that the best way to prevent human casualties caused by wildlife is by offering conservation and education training to the local people [54% (n = 233)]. This was followed by conducting wildlife monitoring and

TABLE 4 The determinants of respondents' (N = 438) attitudes toward tiger conservation based on Tobit regression models.

Explanatory variables	Estimates	Std. error	Z-value	Pr (>|z|)
(Intercept)	1.17	0.39	2.96	**0****
Ethnicity				
Dalit	0.29	0.41	0.70	0.48
Janajati	−0.62	0.28	−2.24	**0.03***
Gender				
Male	0.47	0.24	1.97	**0.05***
Age group				
41–60	0.07	0.25	0.28	0.78
61–80	−0.31	0.33	−0.96	0.34
Above 80	−0.33	1.19	−0.28	0.78
Source of income				
Animal husbandry	−1.97	0.58	−3.39	**0*****
Business	−0.89	0.69	−1.28	0.2
Foreign employment	−0.17	0.84	−0.20	0.84
Governmental job	−0.63	0.43	−1.45	0.15
Work on daily wages	−0.66	0.28	−2.36	**0.02***
Can you differentiate leopards from tigers?				
Yes	0.59	0.23	2.60	**0.01****

*p < 0.10, **p < 0.05, and ***p < 0.01.

information sharing programs [29% (n = 127)] and providing adequate compensation to victims [15% (n = 67)]. A small percentage of respondents mentioned other techniques as a solution to this issue [2% (n = 6)] (χ^2 = 259.31, df = 3, p < 0.05) (Figure 4).

Based on the findings, most respondents [48% (n = 215)] cited the potential for tourism development in their region as the primary motivation for conservation efforts. A smaller percentage of respondents [15% (n = 66)] mentioned the endangered status of tigers as a reason for conservation, while 22% (n = 96) highlighted the role of tigers in maintaining ecosystem balance. A small portion of respondents [5% (n = 22)] were motivated by the beauty of tigers, and 9% (n = 39) (χ^2 = 267.5, df = 4, p < 0.05) considered religious beliefs as their reason for conservation efforts.

4 Discussion

Our study presents the most in-depth analysis of people's attitudes toward tigers and their conservation in Bardiya National Park. Although Bardiya National Park experiences severe human–wildlife and human–tiger conflicts, social factors shaping an individual's position in society had a greater influence on attitudes toward tigers than direct negative experiences with tigers. We found a significant influence of gender, ethnicity, source of income, and economic status. The finding is comparable to reports of positive attitudes toward tigers of the majority of the local people in Nepal (Dhungana et al., 2022) and Central India (Reddy and Yosef, 2016).

In the case of gender, women were more likely to have negative attitudes toward tigers and their conservation than men (Carter and Allendorf, 2016; Doubleday and Rubino, 2022). Paudel et al. (2024) mentioned that in 2019–2023 in the Bardiya–Banke Complex, a total of 76 human attacks by wildlife were recorded, of which 42% were on female individuals. Because of such a high number of attacks, women may feel that they are more vulnerable, and they have developed negative attitudes toward wildlife conservation. Similarly, studies in Chitwan National Park (CNP), another prominent tiger-bearing park in Nepal, found that women may

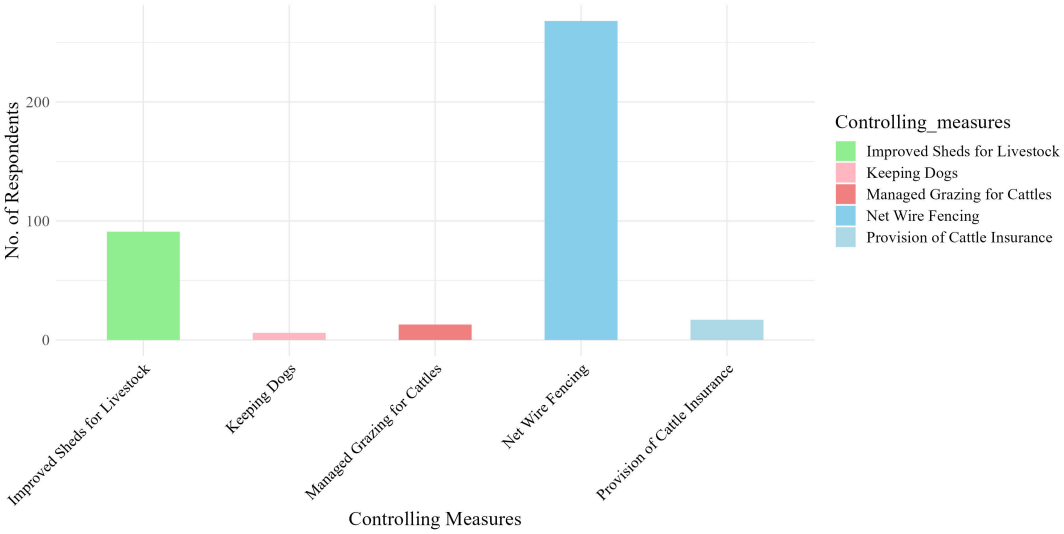

FIGURE 3
Controlling measures suggested by the respondents.

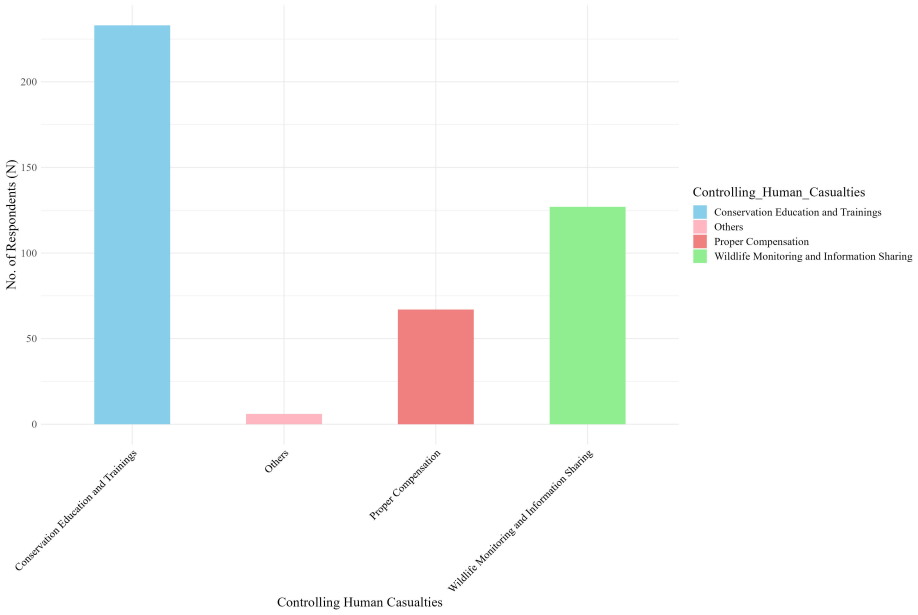

FIGURE 4
Human casualty control measures.

develop negative attitudes toward tigers due to a lack of control over their interactions with them (such as being forced to enter forests to gather necessary natural resources) and limited perspectives on the advantages of doing so (Carter et al., 2014). Similarly, Doubleday and Rubino (2022) investigated if and how perceptions of tiger reintroductions are disparate among women and men living in and around Sariska Tiger Reserve in India and reported the clear gendered delineations in perceptions, where male participants predominantly focused on economic and ecological benefits, and female participants highlighted threats to personal safety. The local community around BNP in the study has a positive attitude toward tiger conservation. However, in CNP, Dhungana et al. (2016, 2022) found that many of the local people have negative attitudes toward tigers. Our result indicates that age is not a significant factor in attitudes toward tiger conservation, mirroring the results reported by Dhunagana et al. (2022) in CNP.

The higher caste (BCT) shows a positive attitude toward tiger conservation, which coincides with findings by Carter et al. (2014) and Dhungana et al. (2022). This also corroborates the finding of Heinen (1993) in Koshi Tappu Wildlife Reserve, Nepal, where higher-caste Hindus were more supportive of wildlife conservation. Additionally, in India, nomadic hunting tribes (often lower social strata) were involved in killing tigers, partly due to economic pressure and cultural practices (Malviya et al., 2022). However, Bhattarai et al. (2013) concluded that *Tharu* Janjati show a more positive attitude toward forest and resource conservation, which contradicts our findings. As the *Tharu* are the native residents and have been involved in the early stages of tiger conservation, and also because of their dependency on the forest, they are more vulnerable to tiger attacks, which may lead them to develop a negative attitude toward tiger conservation. Our study found a significant link between education and attitudes toward tiger conservation, while Shahi et al. (2023) observed a positive association. Similarly, in Kenya, the education level did not correlate with attitudes toward elephant conservation (Gadd, 2005). Also, Malviya et al., 2022 concluded that in India, education was inversely related to negative opinions about tiger conservation, while Carter et al. (2014) and Dhungana et al. (2022) highlighted education's crucial role in tiger conservation in Chitwan National Park.

Community people are very interested in protecting tigers, even though human–tiger conflicts are rising. This positive view may come from their town's "Tigerland" reputation and the revenue they make from tiger tourism (Gurung et al., 2008; Karanth and Nepal, 2012; Carter et al., 2012; Bhattarai and Fischer, 2014; Carter and Allendorf, 2016; Pudasaini, 2020). Notably, economic status positively affected attitudes toward tiger conservation, similar to the findings reported by Dhungana et al. (2022). We assume that the positive attitudes of well-off families may have mainly stemmed from their better access to conservation awareness, education, conservation benefits, and relief payments, as well as their enhanced capacity to cope with potential costs of tiger conservation. Since education can foster greater tolerance toward carnivores by shaping attitudes through rational thinking (Woodroffe et al., 2005) and expanding understanding of predator conservation (Espinosa and Jacobson, 2012), it is essential to strengthen conservation education programs, particularly for illiterate and less-educated communities living near the park.

Our study found that over 50% of the respondents were involved in daily wage work, such as guiding, driving, and other tourism-related activities. Indeed, 71% of local people are in favor of tiger conservation, indicating that the local people in the study area are more likely to be engaged in and benefit from ecotourism

activities. They get seasonal employment in lower-paid positions, particularly as housekeepers and cooks in hotels, and this supports the positive attitudes of the community people toward tiger conservation. However, Shahi et al. (2023) observed that in BNP, the community had negative attitudes because of conflict with the park staff and military guards, as well as ineffective service delivery from the national park office. Due to the community's heavy reliance on agriculture and livestock rearing, the short-term impact indicates that individuals who farm cows, buffalos, ducks, chickens, sheep, or goats are experiencing greater economic losses due to human–wildlife conflict.

The dependency on the park resources also influenced residents' attitude (Shahi et al., 2023), but despite their high dependence on forest resources, community people had a positive attitude toward tiger conservation. However, Shahi et al. (2023) concluded that the community had a negative attitude toward the park management. Also, retaliatory killing of tigers has been reported in other tiger-occupied landscapes (Miquelle et al., 2005; Goodrich et al., 2011; Dhungana et al., 2016). However, in BNP, no retaliatory killing of tigers has been recorded up to 2024, despite a sevenfold increase in the tiger population and a high density of 7.15 (SD 0.38) by 2022 (DNPWC and DFSC, 2022). This exemplifies how community engagement and perceived benefits can mitigate conflict, providing a compelling blueprint for other carnivore-dense landscapes across South and Southeast Asia. With the increasing tiger population and high tiger density, this may lead to a rise in human–wildlife conflict in the near future if conservation efforts are not undertaken. Our study also concluded that human–tiger conflict is becoming very high, as in 5 years, a total of 18 individuals were killed and 10 people were injured. Despite the escalating human–tiger conflicts, the local community's remarkable (71%) positive attitude toward tiger conservation offers a critical pathway for coexistence. This increasing conflict in BNP mirrors a pressing challenge for tiger conservation and the wellbeing of rural communities across tiger-bearing landscapes (Goodrich, 2010).

The study found that local respondents believe that conservation education, wildlife monitoring training, net wire fences, and fair relief payments are essential. These measures, also suggested by Kadariya et al. (2023), are seen as crucial for fostering human–wildlife coexistence and maintaining ecological balance. To achieve sustainable carnivore conservation, particularly for iconic species like tigers, a broader, multi-faceted approach is imperative. While our study is based on a limited sample size of households (n = 438) and identified key socio-demographic factors, future research must delve deeper into the causative factors shaping these perceptions and critically examine how the equitable access to and distribution of conservation benefits directly influence stakeholders' attitudes. Incorporating the perspectives of a wider array of stakeholders, including local government bodies, community-based organizations, and non-governmental organizations, is essential for crafting comprehensive conservation strategies that transcend local boundaries. The insights from Bardiya National Park highlight that genuine coexistence between humans and large carnivores is not an idealistic goal but an achievable reality, contingent upon understanding the complex interplay of social, economic, and ecological factors, and fostering a shared vision where both human wellbeing and biodiversity thrive.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval was not required for the studies involving humans because the data were collected using anonymous, voluntary questionnaires focused solely on perceptions and socio-economic information. No sensitive personal data were gathered, and all participants provided informed verbal consent prior to participation. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements because no personally identifiable or sensitive information was collected, and participation was entirely voluntary. Verbal consent was obtained from all respondents prior to the survey, in line with local cultural practices and ethical norms.

Author contributions

PS: Methodology, Writing – review & editing, Formal analysis, Data curation, Writing – original draft, Conceptualization. RK: Conceptualization, Funding acquisition, Writing – review & editing, Investigation, Methodology, Supervision. NS: Methodology, Conceptualization, Writing – review & editing, Investigation, Validation, Supervision, Funding acquisition. UP: Writing – review & editing, Methodology, Data curation, Investigation. RBKC: Writing – original draft, Formal analysis, Methodology, Writing – review & editing, Investigation, Data curation, Conceptualization.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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