TECHNICAL REPORT

The Characteristics of Patients on Dialysis at the National Kidney Center, Kathmandu

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Introduction

Chronic kidney disease (CKD) is a major public health problem globally (Bello et al, 2023). The societal burden of kidney failure is significant due to high treatment costs and extensive impacts on the health and well-being of people living with kidney disease. By 2040, kidney disease is predicted to be the fifth most common non-communicable disease (NCD) driver of mortality, highlighting the growing burden of CKD on the global population (Francis et al. 2024). In Nepal, there is also a rising burden of CKD (Pandey et al 2023) and, as elsewhere, diabetes mellitus type 2 is the leading risk factor, followed by hypertension.

However, there is now also increasing recognition of forms of progressive kidney injury which are not associated with diabetes, vascular disease, or glomerulonephritis and other specific etiologies, and which especially affect the working-age populations of low-and-middle income countries (Rutter et al 2024), often denoted CKD of unknown etiology (CKDu) or CKD of non-traditional etiology (CKDnT). This has also been observed in Nepal, with a reported age-standardized prevalence of CKDnT (defined as eGFR <60 per 1.73m2 by sex, without self-reported diabetes or hypertension and without high albuminuria) of 0.5% and 0.3% among a national sample of men aged 18-60 from rural and urban areas, in comparison to the prevalence of all CKD of 0.9% and 0.8 among men from rural and urban areas, respectively (data from Rutter et al 2024).

Many risk factors for CKDnT have been proposed, ranging from toxicants to genetic susceptibility. However, the hitherto most consistently demonstrated risk factor is exposure to occupational heat stress from a combination of heavy manual work creating high metabolic heat in addition to high environmental heat, i.e. a heat-induced kidney disease (Elinder 2025).

Notably, observations at dialysis centers in Kathmandu, Nepal have indicated an increase of young patients with a recent occupational history of migrant work in hot climates (Sharma et el 2023), suggesting but not proving a heat-stress related etiology.

The present study aimed to characterize the sociodemographic profile and risk factors for kidney diseases among patients currently on hemodialysis at the National Kidney Center (NKC) in Kathmandu through a brief survey, simple enough for widespread use at other dialysis centers in the future. Specifically, we were interested in experiences of migrant work among patients.

Method

The survey was conducted at the National Kidney Center (NKC) in Kathmandu, which provided a list of all patients currently on regular hemodialysis in October, 2024. NKC is a nonprofit NGO having the largest haemodialysis treatment facility in Nepal, operated by Health Care Foundation-Nepal (https://www.nkc.org.np/page/about-nkc). The study was approved by the Ethical Review Board of the Nepal Health Research Council (Reg. No. 184_2023, Approved on l4 June 2023).

After obtaining informed consent, three trained data enumerators from the Nepal Development Society (NeDS) performed bedside data collection during ongoing dialysis sessions (Questionnaire in Appendix). Study data were collected and managed using REDCap electronic data capture tools hosted at NeDS. All data was self-reported; no comparisons were made to information from the patient's dialysis records, which only focused on clinical details and did not convey any desired information except for the exact date of the first dialysis at NKC. Since patients attend dialysis three days a week, it was possible to include all patients during a brief study period, 21 Oct to 25 Oct, 2024. No patient refrained from participation. All patients agreed to bedside interviews during their dialysis session, and the personnel did not report any disruptions to their work. In total, three enumerators working in shifts completed 404 interviews over 5 days.

Results

The patient characteristics

In total, 259 men (65%) and 145 women (35%) were on maintenance dialysis (Table 1). The duration of dialysis was similar between all categories, with a median of 3 years (75th percentile, 6 years). One out of three men had any migration experience, compared to one in every 12 women.

Table 1. Descriptive data for patients currently on dialysis at NKC, Kathmandu

	Men		Women	
	No migrant history (n= 174)	**Migrant history (n=85)**	**No migrant history (n=133)**	**Migrant history (n=12)**
Age when started dialysis*	54 (17, 84)	37 (19, 77)	44 (11, 84)	36 (21, 53)
Duration of dialysis (yrs)*	3 (0, 14)	3 (0, 13)	3 (0, 19)	4 (0, 12)
Present age*	56 (21, 87)	41 (19, 80)	48 (11,85)	37 (28,57)
Time since first diagnosed as kidney disease				
<1 yr	18 (10%)	15 (18%)	15 (11%)	3 (25%)
1-2 yr	25 (14%)	12 (14%)	23 (17%)	1 (8%)
2-5 yr	57 (33%)	19 (22%)	29 (22%)	1 (8%)
5-10 yr	44 (25%)	29 (34%)	54 (41%)	5 (42%)
<10 yr	30 (17%)	10 (12%)	12 (9%)	2 (17%)
Diabetes before diagnosis of kidney disease	58 (33%)	9 (11%)	28 (21%)	1 (8%)
Hypertension before diagnosis of kidney disease	139 (80%)	65 (77%)	98 (74%)	9 (75%)
Diagnosed with kidney disease while abroad	3 (2%)	38 (45%)	2 (2%)	7 (58%)

***Median (min, max)**

Patients with any experience of migration for work were markedly younger at the start of dialysis, compared to those never working abroad, median of 37 (migration) versus 54 (no migration) years in men, and 36 (migration) versus 44 (no migration) years in women. The bimodal age distribution in migrant men should, however, be noted. Almost all dialysis patients with any migration experience had entered dialysis before age 60 (Figure 1).

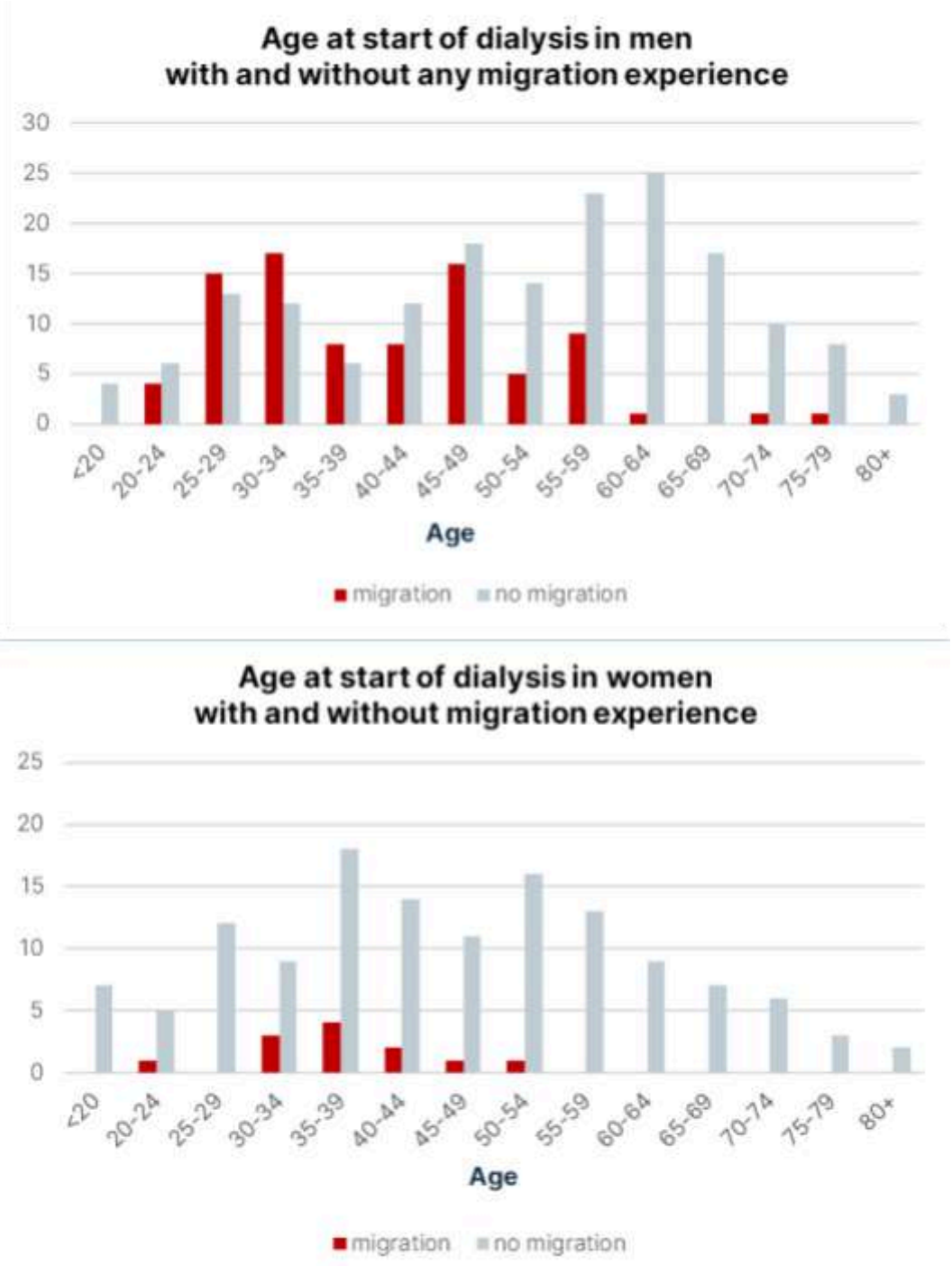

Figure 1. The distribution of age at start of dialysis in men and women with and without migration experience

Migrants on dialysis

Overall, one in four patients reported that they had ever migrated for work. The most visited destination countries (≥ 5 returnees per country) during the last work period are listed in Table 2. The full list of countries is found in Supplementary Table 1.

Table 2.The most common destination countries (most recent destination) for dialysis patients with experience of migration for work

Destination Countries	Men	Women
Dubai/UAE	14	3
Kuwait	5	3
Qatar	10	0
Saudi Arabia	21	3
Malaysia	16	0
India	14	0

In half of the patients with migration experience, the diagnosis of kidney disease was established abroad (Table 1). Notably, about half of the migrants started dialysis within approximately a year after the last return (Table 3), with little variation between calendar years. There was also a small group, 15%, who started dialysis more than 10 years after their last return from migration.

Among migrants with a diagnosis abroad (men and women combined), the median age at start of dialysis was 33 years, and the median start of dialysis in Nepal was within a year after return. For former migrants with diagnosis in Nepal, the median age was considerably higher, 41 years, and the median duration before last return and start of dialysis was 3.5 years.

Table 3. The time gap between last return from migration and the start of dialysis during the period 2019-2024[1]

Start of dialysis	Number of patients starting dialysis	Number of patients with migration experience	Return from migration same or previous calendar year	Return from migration ≥ 10 years earlier	Last return Median, 25, 75 percentiles
2024	74	21	8 (38%)	3 (14%)	2022 (2017,2024)
2023	69	13	7 (54%)	1 (7%)	2022 (2017,2023)
2022	38	10	5 (50%)	3 (30%)	2019 (2011, 2022)
2021	38	7	3 (43%)	3 (43%)	2013 (2001,2021)
2020	37	9	4 (44%)	0 (0%)	2018 (2014, 2020)
2019	28	9	4 (44%)	1(11%)	2017 (2016, 2018)

[1] **The median duration of dialysis was 3 years; with 75 percentile 6 years. The observation period was restricted, thus avoiding inclusion of the most extreme survivors in dialysis. Still, a survivor effect is clearly seen.**

Medical risk factors for kidney disease

In all groups, migrants and non-migrants alike, about eight out of ten patients reported that they had hypertension before their kidney disease (Table 1). Overall, diabetes was somewhat more common in men than in women.

While self-reported hypertension prior to diagnosis of kidney disease was stated by more than half of the patients, a marked difference was that those with migration experience more seldom reported diabetes, alone or in combination with hypertension compared to non-migrants (10% vs 34 % in men, 8% vs 22% in women; Figure 2). In migrant men and women starting dialysis within a year after the last return from migration, the proportion of diabetes with or without hypertension was even smaller, 4%.

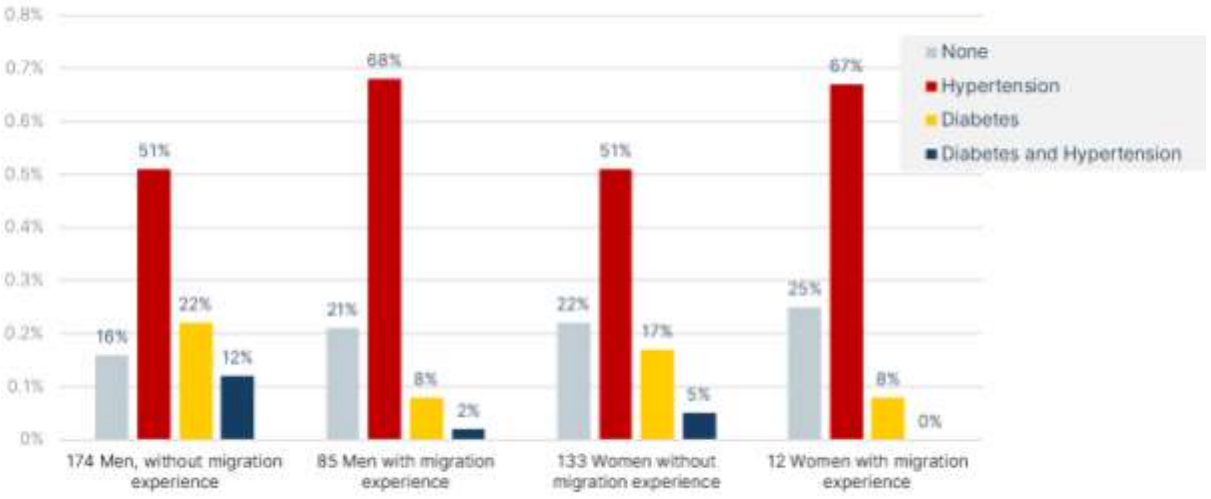

Figure 2. Self-reported diabetes and hypertension in male and female dialysis patient with and without migration experience

Residence before and after start of dialysis

Participants were asked about their current address and their previous address during adulthood, on district, municipality, ward, and tole level (Supplementary Table 2). Most patients were currently living in Kathmandu district (348 patients of which 302 had moved from other districts) and the adjacent districts Lalitpur (31 patients of which 20 had moved from other districts) and Bhaktapur (20 patients, of which 16 had moved from other districts).

By asking for previous addresses, we wanted to assess to what extent the patients were forced to move because of the need of dialysis. We also wanted to explore whether there were any municipalities with a high number of dialysis patients with migrant experience. When broken down to municipality level,

except for the municipalities Kathmandu (57 non-migrants), Tarkeshwor (11 non-migrants), Lalitpur (6 non-migrants), and Kakani (10 non-migrants), there were no municipalities reported with 5 or more patients. Thus, there were no "migration hotspot" municipalities identified.

Discussion and conclusions

Nepali migration is a gendered phenomenon with four out of five migrants being male (Census data 2021), which is reflected in the low prevalence of female dialysis patients with migration experience. Overall, there were more men than women on hemodialysis, reflecting the well-known gender disparity in end-stage kidney disease morbidity and mortality.

There was a striking age difference between patients with and without migration experience. On average, men having ever migrated for work started dialysis 17 years earlier than nonmigrants, and for those with diagnosis abroad even as early as in their early thirties. These lost years have profound implications for the individual and families, beyond ill health and drastically shortened life expectancy. On a societal level, in addition to many productive years lost in these young patients, the direct costs of renal replacement therapy are immensely high.

Notably, half of the migrant patients reported that the diagnosis of kidney disease was established while they were abroad. Among the youngest migrants, a diagnosis abroad and dialysis within a year after return was common. Given that all migrants should undergo a health check before leaving, usually for 2-year contract periods and which is repeated at arrival in several destination countries, it is not likely that they left Nepal with established CKD. Rather, this suggests a rapid progressive kidney function decline, perhaps triggered by an AKI event, or that a previously non-detected mild kidney dysfunction was aggravated while working abroad.

The survey included questions on diabetes and hypertension "before being diagnosed with your kidney disease" but, unfortunately, there was no follow-up question on the duration of these diseases. Moreover, it is not clear whether the patient referred to a diagnosis of end-stage kidney disease and the need for renal replacement therapy or if they refer to a previous diagnosis of CKD at earlier stages.

Diabetes can lead to diabetic nephropathy but not the opposite way around. Thus, observations on diabetes as a risk factor for CKD are not obscured by reverse causation. Clearly, there was less suspected diabetes nephropathy in migrants than in non-migrants, especially in those starting dialysis within the same or previous year as return from the last migration. Thus, the end-stage renal disease (ESRD) in migrants is not explained by undiagnosed diabetics with kidney disease not detected at insufficient health screenings pre-departure or upon arrival in destination countries.

In contrast, uncontrolled hypertension can lead to kidney injury, but hypertension is also a common consequence of kidney disease. The lack of reliable information on the duration of hypertension in our study is thus a limitation as to the understanding of high blood pressure as a risk factor for kidney

disease in this population. While hypertension is common in the Nepalese population, there is yet little knowledge on the relation between hypertension and kidney function in the general population. Own unpublished data from a community-based investigation in men aged 35-74 indicated a prevalence of hypertension (defined as a self-reported medical diagnosis or SBP >140 mm Hg or DBT > 90 mmHg) of 38% in men with eGFR > 60 ml/min/1.73m2, and 40% in those with eGFR <60.

The findings in this scoping study are similar to a previous study among the dialysis patients at NKC in Kathmandu in April-May 2023 (Sharma et al, 2023). Taken together, these investigations have shown that one out of three men on dialysis were former migrants working abroad in countries with a hot climate. Often, kidney disease was detected abroad and progressed rapidly, leading to the need for dialysis at a young age. In the present study, a possible diabetes nephropathy was observed in 10% of the male migrants, while 21% reported neither diabetes nor hypertension. The latter category would formally indicate a possible CKDnT, following the operational definition often used in epidemiological studies (no diabetes, no hypertension).

There is now ample evidence from epidemiological and intervention studies among manual workers in hot climates, sports physiology, and experimental research that occupational heat stress is a risk factor for decreased kidney function, AKI and CKD (Elinder 2025). This scoping study did not aim to elucidate working conditions among dialysis patients - this will follow in extended in-depth studies - but it seems likely that occupational heat stress is an important risk factor for kidney disease in Nepalese migrant workers. Moreover, persons with preexisting diabetes, and hypertension would be at an even higher risk for heat-related kidney disease. Hence, in populations with a high prevalence of hypertension, the use of an exclusive CKDnT definition for a work-related CKD would lead to substantial underestimation.

In this survey, we observed seemingly similar survival in dialysis among migrants and non-migrants, but the retrospective observation time is too short for any firm conclusions on progression and survival in dialysis. There is a need for longitudinal follow-up and information on reasons for the end of dialysis for any conclusions on progression. There is no renal registry in Nepal, but recent data from the US reported 9.7 expected remaining years of life in prevalent male dialysis patients aged 40-44, compared to 22 years in transplanted patients (USRDS 2024). However, the transplant program in Nepal is still limited.

This brief survey proved to be a feasible and cost-effective way to gain information on the total spectrum of patients currently on dialysis at NKC. We now plan to extend scoping studies, using a slightly revised questionnaire, to other dialysis centers in other provinces of Nepal, with focus on districts with a higher proportion of migrants, aiming to get a broader view on the impact of migration on kidney health in Nepal. These studies will be followed by more extensive questionnaires for selected groups of patients with a focus on occupational health and migratory health experiences.

A scoping study questionnaire can easily be administered and analyzed in other dialysis clinics for continuous monitoring of the composition of patients. If every new patient entering dialysis were to be included, and if the reason and time for end of dialysis also was registered, the dialysis clinic would

have useful data on its operations and its changes over time. There is not yet an ESRD register in Nepal, but such local initiatives might function as seeds for a national register. As scoping study data describe the general spectrum of patients they can also form the basis for in-depth clinical studies. Moreover, they are needed for health economical assessments for different CKD entities. Especially, the ESRD- related costs of migration in Nepal can be calculated, and followed over time.

The observation of such a large proportion of migration-associated life-threatening kidney disease calls for good pre-migration health examinations and health advice. Also, a health examination after the end of a contract period is warranted for the detection of kidney disease at earlier stages, thus enabling a possibility to reduce the risk for progression into late stage CKD by proper medical advice and treatment. Most importantly, the findings highlight the immediate need for primary prevention of workplace heat stress in destination countries.

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Supplementary material

Questionnaire (English translation)

Enumerator ID			
Patient initials			
Unique study ID			
Date of birth	YY/MM/DD		
Sex	Male, Female		
When were you first informed that your kidneys did not function well?	<10 yrs ago; 5-10 yrs ago; 2-5 yrs ago; 1-2 yrs ago, <1 yr ago		
Where were you diagnosed?	Nepal Abroad		
Start of dialysis	YYYY		
Did you have diabetes before being diagnosed with your kidney disease?	Yes, No		
Did you have hypertension before being diagnosed with your kidney disease?	Yes, No		
Have you ever migrated abroad for work?	Yes, No		
	If yes…..	When did you return from abroad last time	YYYY
		In which country did you work the last time (most recently)	
Current address	District, municipality		
	Municipality		
	Ward		
	Tole		
Previous address	District, municipality		
	Municipality		
	Ward		
	Tole		

Supplementary Table 1. All reported countries (most recent destination) in dialysis patients with experience of migration for work

Destination Country	Men	Women
Saudi Arabia	21 (25%)	3 (25%)
Malaysia	16 (19%)	
UAE (Dubai)	14 (16%)	3 (25%)
India	14 (16%)	
Qatar	10 (12%)	
Kuwait	5 (6%)	3 (25%)
Israel		2 (17%)
Bahrain	1 (1%)	
Iraq		1 (8%)
Cambodia	1 (1%)	
USA	1 (1%)	
UK	1 (1%)	
Iceland	1 (1%)	

Supplementary Table 2. Present and previous addresses among men and women on dialysis at NKC, Kathmandu

	Previous address		Present address	
	No migration for work	Ever migration for work	No migration for work	Ever migration for work
PROVINCE 1 Koshi				
Bhojpur District	1 (0.3%)			
Dhankuta District	1 (0.3%)			
Ilam District	1 (0.3%)	2 (2.1%)		
Jhapa District	1 (0.3%)	1 (1.0%)		
Khotang District	2 (0.7%)	1 (1.0%)		
Morang District	4 (1.3%)			
Okhaldhunga District				
Panchthar District	1 (0.3%)	2 (2.1%)		
Sankhuwasabha District	3 (1.0%)	6 (6.2%)		
Solukhumbu District				
Sunsari District	4 (1.3%)	1 (1.0%)		
Taplejung District				
Terhathum District		1 (1.0%)		
Udayapur District	8 (2.6%)	1 (1.0%)		
PROVINCE 2 Madhesh				
Saptari District	1 (0.3%)	2 (2.1%)		
Siraha District	2 (0.7%)	2 (2.1%)		
Dhanusa District	2 (0.7%)	1 (1.0%)		

	Previous address		Present address	
	No migration for work	Ever migration for work	No migration for work	Ever migration for work
Mahottari District	4 (1.3%)	1 (1.0%)		
Sarlahi District	8 (2.6%)			
Bara District	4 (1.3%)	2 (2.1%)		
Parsa District	2 (0.7%)			
Rautahat District	2 (0.7%)			
PROVINCE 3 Bagmati				
Sindhuli District	3 (1.0%)	3 (3.1%)		
Ramechhap District	10 (3.3%)	3 (3.1%)		
Dolakha District	6 (2.2%)	6 (6.2%)		
Bhaktapur District	5 (1.6%)		16 (5.4%)	4 (4.1%)
Dhading District	16 (5.2%)	6 (6.2%)		
Kathmandu District	88 (28.7%)	9 (9.3%)	270 (87.9%)	78 (80.4%)
Kavrepalanchok District	10 (3.3%)	2 (2.1%)	2 (0.7%)	1 (1.0%)
Lalitpur District	8 (2.6%)	3 (3.1%)	17 (5.5%)	14 (14.4%)
Nuwakot District	22 (7.2%)	6 (6.2%)	2 (0.7%)	
Rasuwa District	2 (0.7%)			
Sindhupalchok District	13 (4.2%)	4 (4.1%)		
Chitwan District	2 (0.7%)			
Makwanpur District	7 (2.3%)	1 (1.0%)		
PROVINCE 4 Gandaki				
Baglung District	2 (0.7%)	5 (5.2%)		
Gorkha District	10 (3.3%)	4 (4.1%)		
Kaski District	3 (1.0%)			
Lamjung District	1 (0.3%)	2 (2.1%)		
Manang District	1 (0.3%)			
Mustang District				
Myagdi District	1 (0.3%)	2 (2.1%)		
Nawalpur District	1 (0.3%)			
Parbat District	1 (0.3%)	1 (1.0%)		
Syangja District	4 (1.3%)	1 (1.0%)		
Tanahun District	6 (2.2%)	2 (2.1%)		
PROVINCE 5 Lumbini				
Kapilvastu District				
Parasi District				
Nawalparasi District	3 (1.0%)			
Rupandehi District	3 (1.0%)	3 (3.1%)		
Arghakhanchi District	2 (0.7%)			

	Previous address		Present address	
	No migration for work	Ever migration for work	No migration for work	Ever migration for work
Gulmi District	2 (0.7%)	2 (2.1%)		
Palpa District	1 (0.3%)			
Dang District	1 (0.3%)			
Pyuthan District	2 (0.7%)			
Rolpa District		1 (1.0%)		
Eastern Rukum District	1 (0.3%)	2 (2.1%)		
Banke District	4 (1.3%)			
Bardiya District	1 (0.3%)			
PROVINCE 6 Karnali				
Western Rukum District				
Salyan District	3 (1.0%)	2 (2.1%)		
Dolpa District				
Humla District				
Jumla District				
Kalikot District	1 (0.3%)			
Mugu District				
Surkhet District				
Dailekh District				
Jajarkot District	1 (0.3%)			
PROVINCE 7 Sudurpashchim				
Kailali District	2 (0.7%)			
Achham District				
Doti District				
Bajhang District	1 (0.3%)			
Bajura District	1 (0.3%)			
Kanchanpur District				
Dadeldhura District	1 (0.3%)			
Baitadi District				
Darchula District	3 (1.0%)			