Analysing Sex Ratio Variables in Nepal

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Abstract

In some reptiles (for example the turtle) and birds (for example *Alectura lathami*) incubation temperature plays pivotal role for sex determination. Mendal's theory argues that there is an equal chance of having male and female offspring. However, whether this applies to humans and specifically all castes (ethnic groups) in a Nepalese population is researchable. This paper tested two hypotheses: (a) whether there is statistically significant relationship between temperature and sex ratio and (b) whether there is statistically significant relationship between caste type and sex ratio. Since Nepal is an ideal place to test these hypotheses we used the population data of Nepal (1991). To test the first hypothesis, we applied Chi-Square test and found that the temperature has no statistically significant role on human sex determination. For the second hypothesis, we applied Z-test. In 43 castes, we found that there was statistically significantly higher number of male than female population. In another 22 castes, the female population was found statistically significantly higher than the male population. This led us to conclude that, in some castes, probability of having a male or female infant is statistically higher. This does not support Mendal's theory. Mendal's theory is well tested and most of people may not agree with this conclusion. If so, this article raises a critical question of who is right, statistical theory or Mendal's theory.

Key words: caste, sex ratio, population, Nepal

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1. Introduction

During zygote formation (fertilization) in human beings, male meiotic cell (sperm) carries millions of equal numbers of 'X' and 'Y' chromosomes and female meiotic cell (ovum) carries only the 'X' chromosome. Based on Mendal's theory, there is an equal chance of fertilizing the ovum (X chromosome) by 'X' and 'Y' male chromosomes. Therefore according to Mendal's theory, there should be an equal number of males and females in the population or at least they should not significantly differ statistically. However, in turtles (Reptiles) eggs incubated above of about 30ºC develop into females and below than that develop males (Ewert and Nelson, 1991). Similarly, the Australian brush-turkey Alectura lathami (Aves) hatches more males at low incubation temperatures and more females at high temperatures, whereas the proportion is 1 : 1 at the average temperature (Goth and Booth, 2004). Citing these examples of Reptiles and Aves, we can argue that temperature may play an important role for the human sex determination, too.

On the other hand, in a long experience with diverse communities in Nepal, the main author of the article had noted that some castes/ethnic groups had more number of females/males than males/females than in other castes. It has been posited by the authors that this is not due to chance. Based on this evidence, this study analyzed the population data of Nepal and tested two hypotheses. Firstly, whether there was statistically significant relationship between temperature and sex ratio; and secondly, whether there was statistically significant relationship between caste type and sex ratio. If there was statistically significantly higher number of male or female population in some castes then the subsequent objective of the paper would be to rank them from highest to lowest.

2. Why was Nepal selected for this research?

Nepal was selected for this study because of four main reasons. Firstly, because of higher altitudinal range (60 meter to 8848 meter from sea level) Nepal has a high level of climatic diversity (tropical to alpine). Therefore, we were able to get population data from different climatic zone for testing our first hypothesis that there is statistically significant relationship between temperature and sex ratio.

Secondly, Nepal is an ethnically diverse county where at least 101 different castes (ethnic groups) are clearly identified in population census in 2001 (CBS, 2002). The word 'caste is' derived from the Portuguese word 'Casta' which means pure of chaste. In Nepal (in Hindus), caste refers a hereditary social class stratified according to ritual purity. Thirdly, Nepal is one of the very few countries in the world where caste carries a significant sense among the people for many cultural and religious matters (CBS, 2001). Dhital (1990) strongly asserts that inter-caste marriage is vehemently opposed and avoided in Nepalese society. As a result, there is a reasonable chance of having homogenous population in terms of caste purity for many generations. Fourthly, although the technology for gender selection in humans is available in Nepal and there is a preference for Nepalese people to want to have son rather than daughter too, there is no known case of male gender selection due to heavy penalties or unaffordable technology until 2001, which is prior to data being utilized for this analysis. Nepal is one of only two

countries in the world where females have lower life expectancy rate (53.5 yr) than males (55 yr) (Family Planning Association of Nepal, 2000). Based on this, there should be a female lower population than male however but the female population (50.04%) is higher than male (49.96%) by 0.08%. These facts independently verify the claim. The last three reasons are ideal for testing our second hypothesis 'there is statistically significant relationship between caste type and sex ratio'. Therefore, Nepal was the ideal place for testing the given objectives

3. Methods

This research was carefully designed to test two hypotheses 'there is statistically significant relationship between temperature and sex ratio' and 'there is statistically significant relationship between caste type and sex ratio'. The population census data of 2001 was taken from Central Bureau of Statistics, Nepal (CBS, 2002)

In order to test the first hypothesis, physiographic regions were chosen as a proxy of different temperatures. Low land (high temperature), middle hill (middle level temperature) and high hill (low temperature) physiographic regions were considered as three different temperate zones. After having sex ratio and population census data from 2001 (CBS, 2002) of all regions we applied Chi-Square test.

For the second hypothesis, we analyzed the data of 101 clearly identified castes from the population census data of 2001. This hypothesis was tested in two different perspectives. First, taking Mendalian sex ratio as a population ratio and second, taking Nepalese sex ratio as a population ratio. In first perspective we supposed that the gender ratio of any caste should be 50:50 (followed Mendal's Theory). In second case, the Nepalese population statistics were used for sex ratio. Therefore, instead of taking gender ratio of 50:50 we took the national ratio so that we can capture any national variations.

The Z-test was used to analyze these two perspectives by applying three confidence levels (90%, 95% and 99.9%). The formula is given below (Keller, B., Warrack, B. and Bartel, H., 1994)

$$Z = \frac{Ps - P}{\sqrt{P(1-P)/n}} \quad \text{.....1}$$

'Ps' is sample proportion of male or female population of a given caste and 'P' is expected proportion of male or female. In case of first perspective, it is 0.50:0.50 (Mendalian theory) and in case of second perspective, it is 0.49960025:0.50039975:: Male:Female (Nepalese population proportion). And 'n' is the population of caste under consideration.

The conclusions were reached as follows. If the castes for which the calculated value of Z is greater than its tabulated value (at positive site) in a given confidence level then the caste has a statistically significantly higher number of male populations than female. Similarly, if the castes for which the calculated value of Z is lower than its tabulated

value (at negative site) in a given confidence level then the caste has a statistically significantly higher number of females than males.

If there is statistically significantly higher number of males or females in many castes then our subsequent objective was to rank them from higher to lower category. Therefore, after having calculated Z values, we ranked all the castes whose Z calculated values were higher (lower in case of female) than Z-tabulated value in descending (ascending in case of female) order.

4. Results and Discussion

The population data of all 101 castes are given in the Appendix (Table A).

First Hypothesis: While applying the Chi-Square test it was found that there was no statistically significant relationship between the physiographic regions and sex ratio. This showed that in case of human, unlike turtle, temperature has no any significant effect on sex determination.

Second Hypothesis (using Mendalian sex ratio as a population proportion): We calculated the Z-value (Z-test based on the proportion of male and female) based on above formula and analyzed the result at three confidence levels (90%, 95% and 99.9%). The summary is given in Table 1 and detail of calculation is given in Annex (Table B). Numbers of castes with null hypotheses true are increasing with higher confidence level (Table 1). The analyses even at very high confidence level (99.9 percent) shows that there are 41 castes in which male population is statistically significantly higher than female population and in 22 castes opposite is the result.

Second Hypothesis (using Nepalese sex ratio as a population proportion): We applied the same principle as in the above. The summary of the result is provided in Table 1 and detail of calculation provided in Annex (Table C). At 99.9% confidence level, in 43 castes, statistically significantly higher numbers of males are found than females and in 22 castes significantly higher numbers of females are found than males. Null hypothesis was true in only 36 castes (Table 1).

Table 1: Number of castes concluded at three different confidence levels

	Expected Ratio based on Mendelian Theory (Male:Female::50:50)			Ratio of Nepal's Population (Male:Female::0.49960025: 0.50039975)		
Confidence interval %	N	F	M	N	F	M
90	15	32	54	12	32	57
95	19	30	52	20	28	53
99.9	38	22	41	36	22	43

Note: 'N' number of castes in which null hypothesis is true (i.e., male and female population ratio is statistically significantly not different), 'F' number of castes having statistically significantly higher number of females than males and 'M' number of castes having statistically significantly higher number of males than females.

Ranking (caste having statistically higher number of female population than male): The ranking is based on the Z-calculated value based on the sex ratio of Nepalese population. Among the 22 castes, we found that the *Magar* caste has the statistically significantly highest female population then male population followed by *Gurung* and *Kami*. The ranking orders of 22 castes are given in Table (2a).

Table 2a: Ranking of castes having significantly higher number of females than males at 99.9 percent confidence level

Castes	Z-calculated	Rank	Castes	Z-calculated	Rank
MAGAR	-41.4252	1	SANYASI	-6.9806	12
GURUNG	-33.6633	2	BRAHMU/BARAMU	-5.83071	13
KAMI	-31.7786	3	DURA	-5.77225	14
BRAHMAN - HILL	-25.0584	4	YAKKHA	-5.66737	15
CHHETRI	-23.2522	5	KUMAL	-5.14813	16
DAMAI/DHOLI	-21.8442	6	THAKALI	-4.74982	17
SARKI	-20.5864	7	GHARTI/BHUJEL	-4.43885	18
LIMBU	-16.4459	8	NEWAR	-4.30684	19
RAI	-13.0809	9	DARAI	-3.84749	20
THAKURI	-8.36287	10	DANUWAR	-3.66254	21
CHHANTEL	-7.30829	11	RAJI	-3.61375	22

Table 2b: Ranking of castes having significantly higher number of males than females at 99.9 percent confidence level

Castes	Z-calculated	Rank	Castes	Z-calculated	Rank
YADAV	54.33873	1	TATMA	9.76111	23
MUSLIM	33.01125	2	HALUWAI	9.74182	24
TELI	23.11869	3	MALLAH	9.72495	25
KURMI	22.61633	4	KUMHAR	9.28125	26
BANIYA	21.45484	5	KAHAR	9.07842	27
KALWAR	20.10536	6	MUSAHAR	8.78503	28
KOIRI	19.0994	7	KHATWE	8.45111	29
BRAHMAN - TARAI	18.40556	8	LODHA	8.25263	30
KANU	18.0451	9	BARAE	8.09608	31
HAJAM/THAKUR	16.16562	10	RAJBHAR	8.00561	32
DHANUK	15.82432	11	BHEDIYAR	7.17235	33
CHAMAR, HARIJAN	15.58862	12	CHIDIMAR	6.63737	34
RAJPUT	15.24604	13	LOHAR	6.6199	35
SUDHI	15.17966	14	NURANG	6.60267	36
BANGALI	15.10612	15	CHEPANG (PRAJA)	4.95725	37
DUSADH/PASWAN	14.62005	16	BHOTE	4.73397	38
NUNIYA	13.82454	17	BING/BINDA	4.10756	39
THARU	12.89384	18	MALI	3.54185	40
KEWAT	12.63809	19	DOM	3.5025	41
DHOBI	12.13146	20	LEPCHA	3.47119	42
MARWADI	11.63131	21	SUNUWAR	3.08508	43
BADHAE	10.93659	22			

Ranking (caste having statistically higher number of male population than female): The same principle as discussed above was applied. While ranking all 43 castes, we found that the *Yadav* caste has the statistically significantly highest male population then female followed by *Muslim* and *Teli*. The ranking orders of 43 castes are given in Table (2b).

5. Conclusion

The population data from different physiographic regions of Nepal showed that the temperature has no statistically significant role on human sex determinations.

However, the second hypothesis indicated that in 43 castes there is statistically significantly higher number of male than female population. Among them, *Yadav*, *Muslim* and *Teli* castes are ranked first, second and third. In another 22 castes, females were statistically significantly higher than males in the population. *Magar*, *Gurung* and *Kami* ranked as the top three respectively. This leads us to conclude that, in some castes, probability of having male/ female infant is statistically significantly higher/lower. This does not provide support for Mendal's theory. However Mendal's theory is well tested and thus raises the question which one is right, statistical theory or Mendal's theory.

References

Central Bureau of Statistics (CBS), 2002. Statistical Pocket Book Nepal, His Majesty's Government, National Planning Commission Secretariats, Kathmandu, Nepal

Central Bureau of Statistics (CBS), 2001. Population Census 2001: National Report. UNFPA Nepal for National Planning Commission Secretariat, Kathmandu, Nepal

Dhital, R., 1990. Child Marriage in Nepal, http://www.cwin.org.np/resources/issues/child_marriage.htm cited in 3/8/2005

Ewert, M. A. and C. E. Nelson, 1991. Sex determination in turtles: diverse patterns and some possible adaptive values. *Copeia* 1991: 50-69

Family Planning Association of Nepal, 2000. http://www.fpan.org/demo/intro.html cited in 4/8/2005

Goth, A. and D.T Booth, 2004. Temperature-dependent sex ratio in a bird, Biology letters http://galliform.bhs.mq.edu.au/Megapode_project/Reprints/goeth&booth.pdf

Keller, B., Warrack, B., and H. Bartel, 1994. Statistics for Management and Economics, Third Edition, Wadsworth Publishing Company, Belmont California

O'Neil, D., 2005. Mendel's Genetics http://anthro.palomar.edu/mendel/mendel_1.htm Cited on 4/8/05

Table A: Population of males and females in Nepal according to caste

Name of Caste		Total Population	%	Male	Female
No	NEPAL	22736934	100.00	11359378	11377556
1	CHHETRI	3593496	15.80	1774709	1818787
2	BRAHMAN - HILL	2896477	12.74	1426915	1469562
3	MAGAR	1622421	7.14	784828	837593
4	THARU	1533879	6.75	774924	758955
5	TAMANG	1282304	5.64	641361	640943
6	NEWAR	1245232	5.48	620213	625019
7	MUSLIM	971056	4.27	501793	469263
8	KAMI	895954	3.94	432937	463017
9	YADAV	895423	3.94	473421	422002
10	RAI	635151	2.79	312363	322788
11	GURUNG	543571	2.39	259376	284195
12	DAMAI/DHOLI	390305	1.72	188329	201976
13	LIMBU	359379	1.58	174760	184619
14	THAKURI	334120	1.47	164643	169477
15	SARKI	318989	1.40	153681	165308
16	TELI	304536	1.34	158647	145889
17	CHAMAR, HARIJAN, RAM	269661	1.19	138878	130783
18	KOIRI	251274	1.11	130424	120850
19	KURMI	212842	0.94	111638	101204
20	SANYASI	199127	0.88	98006	101121
21	DHANUK	188150	0.83	97507	90643
22	MUSAHAR	172434	0.76	88041	84393
23	DUSADH/PASWAN/PASI	158525	0.70	82173	76352
24	SHERPA	154622	0.68	77511	77111
25	SONAR	145088	0.64	72331	72757
26	KEWAT	136953	0.60	70815	66138
27	BRAHMAN - TARAI	134496	0.59	70623	63873
28	BANIYA	126971	0.56	67308	59663
29	GHARTI/BHUJEL	117568	0.52	58023	59545
30	MALLAH	115986	0.51	59649	56337
31	KALWAR	115606	0.51	61221	54385
32	KUMAL	99389	0.44	48883	50506
33	HAJAM/THAKUR	98169	0.43	51617	46552
34	KANU	95826	0.42	50706	45120
35	RAJBANSI	95812	0.42	48234	47578
36	SUNUWAR	95254	0.42	48065	47189
37	SUDHI	89846	0.40	47198	42648
38	LOHAR	82637	0.36	42270	40367
39	TATMA	76512	0.34	39606	36906
40	KHATWE	74972	0.33	38643	36329
41	DHOBI	73413	0.32	38350	35063
42	MAJHI	72614	0.32	36367	36247
43	NUNIYA	66873	0.29	35224	31649
44	KUMHAR	54413	0.24	28289	26124
45	DANUWAR	53229	0.23	26192	27037
46	CHEPANG (PRAJA)	52237	0.23	26685	25552
47	HALUWAI	50583	0.22	26387	24196

48	RAJPUT	48454	0.21	25905	22549
49	KAYASTHA	46071	0.20	23343	22728
50	BADHAE	45975	0.20	24160	21815
51	MARWADI	43971	0.19	23205	20766
52	SANTHAL/SATAR	42698	0.19	21515	21183
53	DHAGAR/JHAGAR	41764	0.18	20892	20872
54	BANTAR	35839	0.16	18139	17700
55	BARAE	35434	0.16	18479	16955
56	KAHAR	34531	0.15	18109	16422
57	GANGAI	31318	0.14	15808	15510
58	LODHA	24738	0.11	13018	11720
59	RAJBHAR	24263	0.11	12755	11508
60	THAMI	22999	0.10	11392	11607
61	DHIMAL	19537	0.09	9646	9891
62	BHOTE	19261	0.08	9959	9302
63	BING/BINDA	18720	0.08	9641	9079
64	BHEDIYAR/GADERI	17729	0.08	9342	8387
65	NURANG	17522	0.08	9198	8324
66	YAKKHA	17003	0.07	8132	8871
67	DARAI	14859	0.07	7195	7664
68	TAJPURIYA	13250	0.06	6532	6718
69	THAKALI	12973	0.06	6216	6757
70	CHIDIMAR	12296	0.05	6516	5780
71	PAHARI	11505	0.05	5803	5702
72	MALI	11390	0.05	5884	5506
73	BANGALI	9860	0.04	5680	4180
74	CHHANTEL	9814	0.04	4545	5269
75	DOM	8931	0.04	4631	4300
76	KAMAR	8761	0.04	4516	4245
77	BOTE	7969	0.04	3881	4088
78	BRAHMU/BARAMU	7383	0.03	3441	3942
79	GAINE	5887	0.03	2857	3030
80	JIREL	5316	0.02	2582	2734
81	ADIBASI/JANAJATI	5259	0.02	2558	2701
82	DURA	5169	0.02	2377	2792
83	CHURAUTE	4893	0.02	2532	2361
84	BADI	4442	0.02	2152	2290
85	MECHE	3763	0.02	1830	1933
86	LEPCHA	3660	0.02	1935	1725
87	HALKHOR	3621	0.02	1848	1773
88	PUNJABI/SIKH	3054	0.01	1567	1487
89	KISAN	2876	0.01	1382	1494
90	RAJI	2399	0.01	1111	1288
91	BYANGSI	2103	0.01	1094	1009
92	HAYU	1821	0.01	892	929
93	KOCHE	1429	0.01	693	736
94	DHUNIA	1231	0.01	614	617
95	WALUNG	1148	0.01	574	574
96	JAINE	1015	0.00	551	464
97	MUNDA	660	0.00	357	303

98	RAUTE	658	0.00	346	312
99	YEHLMO	579	0.00	281	298
100	PATHARKATA/KUSWADIYA	552	0.00	286	266
101	KUSUNDA	164	0.00	85	79
102	DALIT/UNIDENTIFIED DALIT	173401	0.76	85063	88338
103	UNIDENTIFIED CAST/ETHNIC	231641	1.02	116569	115072

Table B: Testing the hypothesis assuming gender ratio of 50:50 (based on Mendel Theory)

Caste Description	Z-calculated	Conclusion at 90% CL[1]	Conclusion at 95% CL[2]	Conclusion at 99.9% CL[3]
CHHETRI	-23.25216	F	F	F
BRAHMAN - HILL	-25.05841	F	F	F
MAGAR	-41.42516	F	F	F
THARU	12.89384	M	M	M
TAMANG	0.36913	Null-true	Null-true	Null-true
NEFAR	-4.30684	F	F	F
MUSLIM	33.01125	M	M	M
KAMI	-31.77862	F	F	F
YADAV	54.33873	M	M	M
RAI	-13.08090	F	F	F
GURUNG	-33.66326	F	F	F
DAMAI/DHOLI	-21.84415	F	F	F
LIMBU	-16.44586	F	F	F
THAKURI	-8.36287	F	F	F
SARKI	-20.58637	F	F	F
TELI	23.11869	M	M	M
CHAMAR, HARIJAN, RAM	15.58862	M	M	M
KOIRI	19.09940	M	M	M
KURMI	22.61633	M	M	M
SANYASI	-6.98060	F	F	F
DHANUK	15.82432	M	M	M
MUSAHAR	8.78503	M	M	M
DUSADH/PASFAN/PASI	14.62005	M	M	M
SHERPA	1.01724	Null-true	Null-true	Null-true
SONAR	-1.11839	Null-true	Null-true	Null-true
KEFAT	12.63809	M	M	M
BRAHMAN - TARAI	18.40556	M	M	M
BANIYA	21.45484	M	M	M
GHARTI/BHUJEL	-4.43885	F	F	F
MALLAH	9.72495	M	M	M
KALFAR	20.10536	M	M	M
KUMAL	-5.14813	F	F	F
HAJAM/THAKUR	16.16562	M	M	M
KANU	18.04510	M	M	M
RAJBANSI	2.11931	M	M	Null-true
SUNUFAR	2.83833	M	M	Null-true
SUDHI	15.17966	M	M	M
LOHAR	6.61990	M	M	M
TATMA	9.76111	M	M	M
KHATFE	8.45111	M	M	M
DHOBI	12.13146	M	M	M
MAJHI	0.44532	Null-true	Null-true	Null-true
NUNIYA	13.82454	M	M	M

KUMHAR	9.28125	M	M	M
DANUFAR	-3.66254	F	F	F
CHEPANG (PRAJA)	4.95725	M	M	M
HALUFAI	9.74182	M	M	M
RAJPUT	15.24604	M	M	M
KAYASTHA	2.86524	M	M	Null-true
BADHAE	10.93659	M	M	M
MARFADI	11.63131	M	M	M
SANTHAL/SATAR	1.60670	M	Null-true	Null-true
DHAGAR/JHAGAR	0.09787	Null-true	Null-true	Null-true
BANTAR	2.31892	M	M	Null-true
BARAE	8.09608	M	M	M
KAHAR	9.07842	M	M	M
GANGAI	1.68391	M	M	Null-true
LODHA	8.25263	M	M	M
RAJBHAR	8.00561	M	M	M
THAMI	-1.41770	F	Null-true	Null-true
DHIMAL	-1.75282	F	F	Null-true
BHOTE	4.73397	M	M	M
BING/BINDA	4.10756	M	M	M
BHEDIYAR/GADERI	7.17235	M	M	M
NURANG	6.60267	M	M	M
YAKKHA	-5.66737	F	F	F
DARAI	-3.84749	F	F	F
TAJPURIYA	-1.61586	F	Null-true	Null-true
THAKALI	-4.74982	F	F	F
CHIDIMAR	6.63737	M	M	M
PAHARI	0.94163	Null-true	Null-true	Null-true
MALI	3.54185	M	M	M
BANGALI	15.10612	M	M	M
CHHANTEL	-7.30829	F	F	F
DOM	3.50250	M	M	M
KAMAR	2.89529	M	M	Null-true
BOTE	-2.31883	F	F	Null-true
BRAHMU/BARAMU	-5.83071	F	F	F
GAINE	-2.25475	F	F	Null-true
JIREL	-2.08474	F	F	Null-true
ADIBASI/JANAJATI	-1.97190	F	F	Null-true
DURA	-5.77225	F	F	F
CHURAUTE	2.44460	M	M	Null-true
BADI	-2.07057	F	F	Null-true
MECHE	-1.67908	F	F	Null-true
LEPCHA	3.47119	M	M	M
HALKHOR	1.24637	Null-true	Null-true	Null-true
PUNJABI/SIKH	1.44762	M	Null-true	Null-true
KISAN	-2.08845	F	F	Null-true
RAJI	-3.61375	F	F	F
BYANGSI	1.85353	M	M	Null-true
HAYU	-0.86706	Null-true	Null-true	Null-true
KOCHE	-1.13750	Null-true	Null-true	Null-true
DHUNIA	-0.08551	Null-true	Null-true	Null-true
FALUNG	0.00000	Null-true	Null-true	Null-true
JAINE	2.73078	M	M	Null-true

MUNDA	2.10195	M	M	Null-true
RAUTE	1.32546	M	Null-true	Null-true
YEHLMO	-0.70650	Null-true	Null-true	Null-true
PATHARKATA/KUSFADIYA	0.85126	Null-true	Null-true	Null-true
KUSUNDA	0.46852	Null-true	Null-true	Null-true

Note: CL, Confidence level, 'M' Male and 'F' Female

[1] Z-calculated value less than -1.29 concludes higher female population and value higher than 1.29 concludes higher male population at 90% confidence level

[2] Z-calculated value less than -1.65 concludes higher female population and value higher than 1.65 concludes higher male population at 95% confidence level

[3] Z-calculated value less than -3.08 concludes higher female population and value higher than 3.08 concludes higher male population at 90% confidence level

Table C: Testing the hypothesis based on the gender ratio of Nepal

Caste description	Z-calculated	Conclusion at 90% CL[1]	Conclusion at 95% CL[2]	Conclusion at 99.9% CL[3]
CHHETRI	-21.73659	F	F	F
BRAHMAN - HILL	-23.69774	F	F	F
MAGAR	-40.40681	F	F	F
THARU	13.88402	M	M	M
TAMANG	1.27448	Null-true	Null-true	Null-true
NEFAR	-3.41468	F	F	F
MUSLIM	33.79910	M	M	M
KAMI	-31.02186	F	F	F
YADAV	55.09529	M	M	M
RAI	-12.44373	F	F	F
GURUNG	-33.07382	F	F	F
DAMAI/DHOLI	-21.34467	F	F	F
LIMBU	-15.96658	F	F	F
THAKURI	-7.90074	F	F	F
SARKI	-20.13483	F	F	F
TELI	23.55990	M	M	M
CHAMAR, HARIJAN, RAM	16.00380	M	M	M
KOIRI	19.50017	M	M	M
KURMI	22.98519	M	M	M
SANYASI	-6.62384	F	F	F
DHANUK	16.17112	M	M	S
MUSAHAR	9.11703	M	M	M
DUSADH/PASFAN/PASI	14.93837	M	M	M
SHERPA	1.33162	M	Null-true	Null-true
SONAR	-0.81386	Null-true	Null-true	Null-true
KEFAT	12.93397	M	M	M
BRAHMAN - TARAI	18.69877	M	M	M
BANIYA	21.73973	M	M	M
GHARTI/BHUJEL	-4.16471	F	F	F
MALLAH	9.99724	M	M	M
KALFAR	20.37720	M	M	M
KUMAL	-4.89608	F	F	F
HAJAM/THAKUR	16.41612	M	M	M
KANU	18.29260	M	M	M
RAJBANSI	2.36678	M	M	Null-true
SUNUFAR	3.08508	M	M	M
SUDHI	15.41931	M	M	M
LOHAR	6.84973	M	M	M

TATMA	9.98226	M	M	M
KHATFE	8.67002	M	M	M
DHOBI	12.34809	M	M	M
MAJHI	0.66076	Null-true	Null-true	Null-true
NUNIYA	14.03129	M	M	M
KUMHAR	9.46775	M	M	M
DANUFAR	-3.47809	F	F	F
CHEPANG (PRAJA)	5.13998	M	M	M
HALUFAI	9.92164	M	M	M
RAJPUT	15.42204	M	M	M
KAYASTHA	3.03685	M	M	Null-true
BADHAE	11.10802	M	M	M
MARFADI	11.79896	M	M	M
SANTHAL/SATAR	1.77190	M	M	Null-true
DHAGAR/JHAGAR	0.26125	Null-true	Null-true	Null-true
BANTAR	2.47028	M	M	M
BARAE	8.24658	M	M	M
KAHAR	9.22700	M	M	M
GANGAI	1.82540	M	M	Null-true
LODHA	8.37838	M	M	M
RAJBHAR	8.13014	M	M	M
THAMI	-1.29645	F	Null-true	Null-true
DHIMAL	-1.64107	F	Null-true	Null-true
BHOTE	4.84493	M	M	M
BING/BINDA	4.21694	M	M	M
BHEDIYAR/GADERI	7.27880	M	M	M
NURANG	6.70850	M	M	M
YAKKHA	-5.56312	F	F	F
DARAI	-3.75004	F	F	F
TAJPURIYA	-1.52384	F	Null-true	Null-true
THAKALI	-4.65876	F	F	F
CHIDIMAR	6.72602	M	M	M
PAHARI	1.02738	Null-true	Null-true	Null-true
MALI	3.62718	M	M	M
BANGALI	15.18551	M	M	M
CHHANTEL	-7.22909	F	F	F
DOM	3.57806	M	M	M
KAMAR	2.97013	M	M	Null-true
BOTE	-2.24746	F	F	Null-true
BRAHMU/BARAMU	-5.76201	F	F	F
GAINE	-2.19341	F	F	Null-true
JIREL	-2.02644	F	F	Null-true
ADIBASI/JANAJATI	-1.91392	F	F	Null-true
DURA	-5.71477	F	F	F
CHURAUTE	2.50053	M	M	Null-true
BADI	-2.01728	F	F	Null-true
MECHE	-1.63003	F	Null-true	Null-true
LEPCHA	3.51956	M	M	M
HALKHOR	1.29448	M	Null-true	Null-true
PUNJABI/SIKH	1.49181	M	Null-true	Null-true
KISAN	-2.04557	F	F	Null-true
RAJI	-3.57459	F	F	F
BYANGSI	1.89019	M	M	Null-true

HAYU	-0.83294	Null-true	Null-true	Null-true
KOCHE	-1.10728	Null-true	Null-true	Null-true
DHUNIA	-0.05745	Null-true	Null-true	Null-true
FALUNG	0.02709	Null-true	Null-true	Null-true
JAINE	2.75625	M	M	Null-true
MUNDA	2.12249	M	M	Null-true
RAUTE	1.34597	M	Null-true	Null-true
YEHLMO	-0.68726	Null-true	Null-true	Null-true
PATHARKATA/KUSFADIYA	0.87004	Null-true	Null-true	Null-true
KUSUNDA	0.47876	Null-true	Null-true	Null-true

Note: 'CL', Confidence level, 'M' Male and 'F' Female

[1] Z-calculated value less than -1.29 concludes higher female population and value higher than 1.29 concludes higher male population at 90% confidence level

[2] Z-calculated value less than -1.65 concludes higher female population and value higher than 1.65 concludes higher male population at 95% confidence level

[3] Z-calculated value less than -3.08 concludes higher female population and value higher than 3.08 concludes higher male population at 90% confidence level