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The first and second waves of the coronavirus (COVID-19) pandemic in Nagaland: across sectional analysis

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ABSTRACT

The COVID-19 pandemic has caused a massive socio-economic crisis across the state due to business interruptions and abandonment from stay-at-home, containment zone, restrictions on human mobility and social-distancing measures. This study aims to investigate the dynamics of the disease spread in different parts of the state. The COVID-19 waves (25 May-25 June, first wave 2020 and 28 March-28 May, second wave 2021) were compared using information collected from Department of Health and Family Welfare, Government of Nagaland and field survey report. Multivariate regression model was developed to evaluate the direct impact of COVID-19 positive case on labour income, poverty, job loss, population density, crude rate spread, health care expenditure and COVID-19 death. This paper also examines the relationship between consumer sentiment and economic progress. It assesses the predictive ability of consumer confidence indices and selected macroeconomic indicators using a simple consumer confidence index which addresses the issue of how confidence indicators bring additional information beyond economic fundamentals. The findings show that the confidence indicator could influence economic performance and be a good predictor of employment, income and expenditure. These results highlight the importance of managing confidence and expectations in COVID-19 crises. Finally the paper investigates the CPI inflation during the first and second wave of COVID-19 pandemic. The COVID CPI inflation rate was 11.83% in the first wave (2020), compared to 7.76% in second wave (2021). As an important driver of the inflation process, inflation expectations must be monitored closely by policymakers to ensure they remain consistent with long-term monetary policy objectives.

Keywords: *Consumer confidence, Socio-economic, Consumer price index and COVID-19*

JEL Classification: C43, E31, E71, J01, J11, I14, I32

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1. Background of the study

The world is encountering sudden socio-economic crisis as a result of the coronavirus pandemic known as "Severe Acute Respiratory Syndrome" (SARS-Cov-2) (Pandey et al. 2020; Lahiri et al. 2020; Arif and Sengupta 2020). COVID-19 has emerged as the largest pandemic experienced worldwide as it has affected more than 220 countries. The coronavirus is determined fundamentally to have manifestations like dry hack, fever, weariness and trouble in breathing, which might be because of fibrosis and accumulation of hack noticeable all around sacs of lungs (Huang et al. 2020). The death rate by the illness is discovered to be high in older and grown-up patients, and furthermore in patients experiencing co-morbidity like asthma, diabetes, malignancy and cardiovascular sicknesses (Dong et al. 2020; Zhou et al. 2020; Chan et al. 2020). The first known case on the serious sickness made by a CoV was reported in 2003, and it was called as "Severe Acute Respiratory Syndrome" (SARS-CoV) that prompted a serious epidemic in China (WHO 2020a; WHO 2020b). A second extreme epidemic by a CoV was accounted for in 2012 in Saudi Arabia, and it was referred as the "Middel East Respiratory Syndrome" (Chafekar and Handling 2018; Yao et al. 2020; Zaki et al. 2012; Lu et al. 2013; Memish et al. 2014; Zumla and Hui 2014; Petersen et al. 2014).

In December 2019, the third serious case by CoV-2 was analyzed first in Wuhan city of Hubei province in China which is presently a pandemic practically in whole world. The viral contamination of severe acute respiratory syndrome coronavirus 2 (SARS-

CoV-2) generates the coronavirus diseases (COVID-19) that is causing the death of numerous people around the world (Gattinoni et al. 2020; Sterpetti 2020; Wang et al. 2020; WHOc 2020). COVID-19 is threatening global public health security and also creating socio-economic issues, such as the contraction of real GDP growth, rise in unemployment, inflation and increase of public debts in countries (Wang and Su 2020; Chaudhary and Sodani 2020).

2. First wave in Nagaland: a lesson

COVID-19 pandemic has swept the India including Nagaland in the last 8 (six) months infecting thousands of people and causing number of deaths. Nagaland, like the rest of the Indian states, has also been exaggerated badly in all spheres of human activities. As of 29 January, 2021, 12088 positive cases, out of which 11804 have been recovered and 78 persons had been death. Nagaland has encounter one of the worst instances of the COVID-19 outbreaks as the fifth highest deaths in the Northeast India, next to Sikkim, Manipur, Tripura, Meghalaya, escalate with its poor healthcare infrastructure (COVID-19 Dashboard 2021). Nagaland is the last of the Northeastern states of India after Sikkim to report COVID-19 positive cases, but remain in fifth position in terms of death in first wave. On 24 March first phase of 21 days stay-at-home commenced in Nagaland, due to this stay-at-home restriction, mobility in grocery and pharmacy, retail, transit to station, visits to parks, recreation and workplaces were reduced respectively. As regards, a number of other non-medical interventions like relief to stranded people, distribution of rations to migrants' workers, preparation of quarantine centres, transport arrangements for bringing people back from different states, IEC (information, education and communication) and activities were not under the preview of stay-at-home. The months of stay-at-home resulted in the fall of income, employment, increasing the poverty and inflation which slowly stabilized after the economy system reopened in late July in most parts of Nagaland. The stay-at-home restrictions had been imposed barring any preparation or coordination with neighbouring states. Financial development went to a granulating end in the state. The stay-at-home had demoralizing impacts on an already slowing economy and people's livelihoods as shops, retailers, factories, transport services and business establishments were shuttered. The stay-at-home in Nagaland didn't help with containing the spread of the COVID-19. Contamination cases continued expanding regardless of Nagaland being in stay-at-home measures (Kupferschmid 2020).

Table 1

State-wise COVID-19 cases and deaths in Northeast India (25 May 2020; 29 Jan 2021)

State	Total positive	Deaths	Deaths rate
Assam	217071	1081	0.50
Tripura	33348	391	1.17
Manipur	29022	370	1.27
Meghalaya	13749	146	1.06
Sikkim	6084	133	2.19
Nagaland**	12088**	78**	0.65**
Arunachal Pradesh	16827	56	0.33
Mizoram	4363	9	0.21
Total	332552	2264	0.68

Source: Department of Health and Family Welfare, Government of Nagaland, 2021

Table 2

District-wise distribution of COVID-19 cases (25 May 2020; 29 Jan 2021)

Districts	Total positive	Total active	Death	Sample tested	Tested per (1000)	Positivity Rate
Dimapur	6470	31	49	49962	128	12.9
Kohima	3779	13	21	36219	130	10.4
Mokokchung	192	5	3	4956	25	3.9
Peren	507	2	0	5940	61	8.5
Tuensang	247	2	1	5547	27	4.5
Kiphire	41	0	1	1155	15	3.5
Longleng	19	0	0	1213	23	1.6
Mon	605	0	2	12950	50	4.7
Phek	47	0	0	2996	18	1.6
Wokha	39	0	1	1575	9	2.5
Zunheboto	142	0	0	2145	15	6.6
Total	12088	53	78	124658	61	9.7

Source: COVID-19 weekly bulletin, Department of Health and Family Welfare, GON, 2021

3. Second wave: a temporal playbook

A second wave of COVID-19 pandemic establishes an imminent threat to society, with an immense toll in terms of human lives and a devastating economic impact. Nonetheless, it is hard to anticipate the future advancement of a coronavirus pandemic and to represent the dissemination across various regions of the world. The second wave of COVID-19 disease is diagnosed mainly with symptoms such dry mouth, xerostomia, aches and pains, diarrhoea, discolouring of figure or toes, sore throat, conjunctivitis, headache, skin rashes, dizziness, fatigue, gastrointestinal, nausea and vomiting (Aleta and Moreno 2020; Buonanno et al. 2020; Win 2020). The main objective of this study is to explain the relationships between infected people of the COVID-19 and demographic and socio-economic determinants that influenced its spread in Nagaland. The temporal playbook of the second wave pandemic can be used by governments, markets analyst and policy makers.

The second wave of COVID-19 in Nagaland, which has been adding caseloads every passing day, is super deadly. From newer strains to added severity, the spike in cases has also been largely seen amongst the younger age groups, the ones between 25-40 years old. While this age group has recently started to inoculate yet, authorities also suggest that the lack of COVID-19 appropriate behaviour is likely a factor responsible for impacting the young and healthy right now, who are also landing up in hospitals and getting impacted. According to recent report, more and more people testing positive for the virus are also at the risk of showcasing vague, unusual symptoms, which were previously not reported in the first wave of coronavirus. The study also found that COVID-19 continues to challenge healthcare services and disrupt social-economic activities (Fairlie et al. 2020; Gallant 2020; Snowden and Graaf 2021). Although more than half of cases of COVID-19 remain asymptomatic, other individuals experience symptoms ranging from influenza-like episodes (fever, cough, myalgia, etc.) to pneumonia, and occasionally respiratory distress along with thromboembolic complications (severe COVID-19).

Lastly, the impact of the COVID-19 second wave on the Nagaland economy is not as bad as the first wave, but the surrounding uncertainties remain. The government policies, of decentralized nature of stay-at-home, better adaptation of people to work-from-home protocols, online delivery models, digital payments system, retails, groceries, fruits and vegetables vendors, pharmacy, constructions works and emergency transport service were actively operating. The second wave has intensified in urban areas, and relative to the first wave, it has spread rapidly across Nagaland, and into rural sector.

Table 3
Comparing the first two months of COVID-19 positive cases and deaths in Nagaland

Month	First wave (2020)	Death in first wave	Month	Second wave (2021)	Total increased	Death in second wave
May 25-27	5	0	March 28-30	3	-2	0
28-30	43	0	31-2	117	+74	0
June 1-3	58	0	April 3-5	136	+78	0
4-6	107	0	6-8	147	+40	0
7-9	127	0	9-11	171	+44	2
10-12	156	0	12-14	206	+50	0
13-15	177	0	15-17	302	+125	1
16-18	195	0	18-20	416	+221	0
19-21	211	0	21-23	655	+444	0
22-24	347	0	24-26	1009	+662	4
25-27	387	0	27-29	1464	+1077	2
28-30	459	0	April/May30-2	2090	+1631	10
July 1-3	539	0	3-5	2612	+2073	9
4-6	625	0	6-8	3475	+2850	19
7-9	673	0	9-11	4178	+3505	18
10-12	774	0	12-14	5151	+4377	32
13-15	902	0	15-17	5971	+5069	27
16-18	978	0	18-20	6756	+5778	29
19-21	1030	0	21-23	7643	+6613	40
22-24	1239	0	24-26	8333	+7094	42
25-27	1289***	4	27-28	9013	+7724	16
Total	1289	4		9013		251

Source: COVID-19 weekly bulletin, Department of Health and Family Welfare, GON, 2021

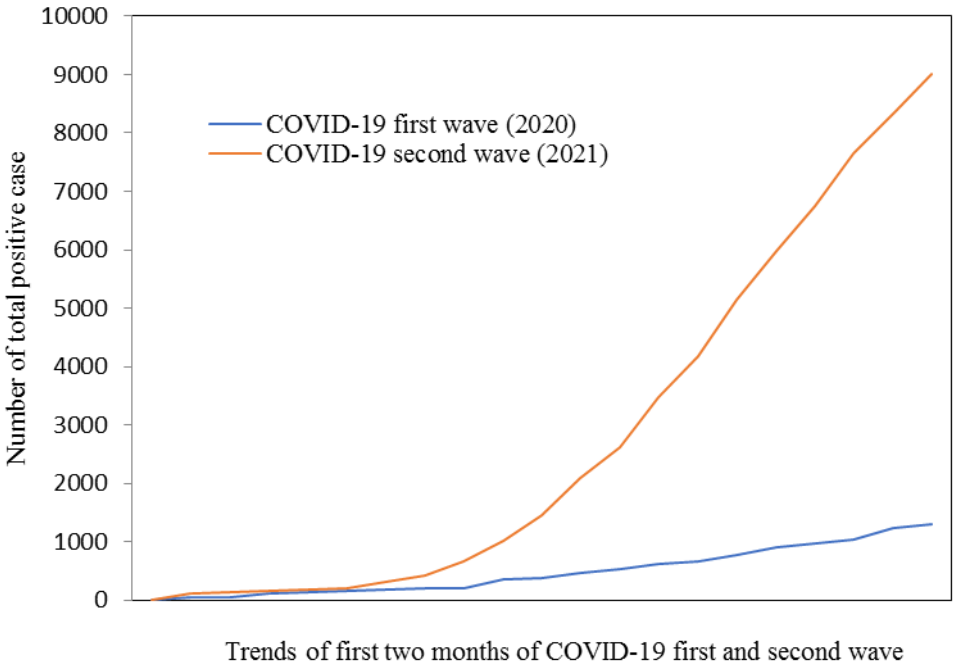

Fig. 1: Comparison of first two months of COVID-19 positive case

4. Materials and methods

Pandemic data and their sources

Study was conducted on Nagaland, one of the Northeast state in India to experience a rapid increase in confirmed cases of COVID-19 and related deaths.

5. Sample, period and measures

Calculation of sample size

Simple random sampling method was applied. From the 80 (N=80) sample population residing in different parts of the districts, have been interview and discuss the wide range of COVID-19 pandemics. Primary data was collected through telephonic interview. Secondary data were collected from Department of Health and Family Welfare, Government of Nagaland.

Table 4
Population demographic involve in both surveys

Gender	First wave (N=80)	Second wave (N=80)
Male	61 (76.25)	54 (67.5)
Female	19 (23.75)	26 (32.5)
Others	00	00
Age**	***	***
Mean	24.83	29.737
Standard Deviation	5.519	6.2495
Range	24.00	29.00
Skewness	1.52	0.668
Kurtosis	2.30	0.082

Source: Author Calculation

Period of study

The significant data reported of first wave of COVID-19 were collected from May 25 to July 25, 2020. The second wave of COVID-19 data was collected from March 28 to May 28, 2021.

Statistical analysis and measures

For the study, simple statistical techniques were used. The data collected are analyzed on the basis of the responses given by the respondents. For this study, all statistical analyses were conducted using SPSS software.

Estimation of crude rate of spread (CRS) of COVID-19

The exploration of the spread of coronavirus disease, some assumptions was formulated. "The crude rate of spread for COVID-19 is calculated by dividing the number of cases recorded by the total population and every resident in the districts is assumed to have had an equal hazard of being infected by this coronovirus. This leads to the second assumption: the same crude rate of COVID-19 spread (CRS) is authentic for the people who have travelled from others districts. The CRS is estimated per thousand through the formula i.e. the number of COVID-19 positive cases (c) divided by the total population (p)" (Jamir 2021a).

$$\text{Crude rate of spread (CRS)} = \frac{\text{Number of cases}}{\text{Total population}} \times 1000.$$

6. Modeling consumer confidence

Notation and motivation

Consumer confidence index

To include well-being indicators relating to economic impact within the pandemic based on government policies, the consumer confidence index (CCI) as a measurable indicator (Batchelor et al. 1998; Delorme et al. 2001). This index is calculated from the time of lowest point of consumer confidence since the outbreak of the pandemic. Consumers are asked whether they believe that the economic conditions in their state have improved in the previous period or will improve in the next period. In practice, the number of answer categories varies from 3 (positive, negative or neutral).

To convert the survey data to a daily measure of consumer confidence, an econometric model was formulated. First, let us denote the response of individual I on the j-th survey question on day t by Z_{ijt} with I and t a before, and j=1…….. J, where J denotes the total number of questions the model. Second, let $Z_{i,t}$ be the overall confidence score of an individual, which s generally obtained simply taking the sum or the average of the J answers provided by the individual I at time t. Finally, but not necessarily, the data is then further reduced by classifying and individual as being in a negative, neutral or positive state of confidence, using

$$\begin{aligned} q_{i,t} &= 1 \; if \; z_{i,t} > v \\ q_{i,t} &= 0 \; if \; |z_{i,t}| \leq v \\ q_{i,t} &= -1 \; if \; z_{i,t} < -v \end{aligned} \qquad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where $q_{i,t}$ is the final classification of the individual and v is a threshold parameter. We collect the values of $q_{i,t}$ in the I x T matrix Q, defined as

$$\begin{bmatrix} q1,1 & q1,2 & \ldots & q1,t & \ldots & q1,T \\ q2,1 & q2,2 & \ldots & q2,t & \ldots & q2,T \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ qi,1 & qi,2 & & qi,t & \ldots & qi,T \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ qI,1 & qI,2 & \ldots & qI,t & \ldots & qI,T \end{bmatrix} \qquad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

To obtain a daily consumer confidence index c_t one may calculate the average of the collected q_{it}'S. This would be equal to the proportion of positive responses minus the proportion of negative response (Lovell 2001).

Consumer price index

A consumer price index (CPI) measures changes in the price level of a weighted average market basket of consumer goods and services purchased by households. The annual percentage change in a CPI is used as a measure of inflation. The weights used to combine them into the higher-level aggregates, and then into the overall index, relate to the estimated expenditures during a preceding whole year of the consumers covered by the index on the products within its scope in the area covered. Ideally, the weights would relate to the composition of expenditure during the time between the price-reference month and the current month. The index reference period, usually called the base year, often differs both from the weight-reference period and the price-reference period (Matsusaka and Sbordone 1995).

Compilation of CPI consists of two stages

Calculating the CPI for the single item

$$CPI = \frac{\text{Market basket of desired year}}{\text{Market basket of Base year}} \times 100$$

Calculating the CPI for the multiple items

$CPI_i = \sum (CPI_i \times W_i) / \sum W_i$

Where the weight $_i$ term do not necessarily sum to 1 or 100

Multivariate regression model

Multivariate regression model to study the relationship between each of the dependent variables and the set of explanatory variable

The model is specified as follows:

$Y=\beta_0+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5\ldots\ldots\ldots\ldots + \beta_nX_n+€$

Where y represents the dependent variable, X_1, X_2, X_3, X_4, X5 …….. X_n are the explanatory variables, β_0 is the intercept, β_1, β_2, β_3, β_4, β5 …….. βn. are the regression coefficients and ε is a random component.

7. Results and Discussions

Consumer confidence index

The consumer confidence index was used to investigate the future development of business activities, households' utilization and saving, in view of responses with respect to their normal financial situation, their sentiment about the general economic situation, unemployment and capability of savings (Ambrocio 2020; Teresiene 2021). The literature provides robust evidence of indicators of consumer confidence being good predictors of consumer spending with a lead content of four to eight months (Gelper et al. 2007; Ludvigson 2004). Consequently, the framework employed in this research work includes business condition, employment situation and household income.

Table 5

Consumer confidence index (Second wave of COVID-19)

Parameters	CCI (1-15) (April)	CCI (15-30) (April)	CCI (1-15) (May)	CCI (15-30) (May)
Current business conditions	28.75	21.50	13.75	9.25
Business conditions for the next six months	32.50	27.25	21.25	12.75
Current employment conditions	26.25	24.00	12.00	10.50
Employment conditions for the next six months	38.75	35.75	26.25	20.00
Total family income for the next six months	26.83	22.50	10.75	5.25

Source: Field survey report, 2021

Respondents were optimistic about the general economic situation during the end September 2020, with net responses gradually picking up between October 2020 and February to March 2021. However, net responses slipped into the pessimistic zone since the beginning of April 2021 i.e., from 28.75% to 9.25% (April-May). Consumers' expectations about the future economic situation also reached boom in December 2021 and worsened thereafter, but they seem to be stabilizing in the current survey round. Even the business conditions for the next six months shows downfall from 32.5% to 12.7%.

Consumer sentiment on the current employment situation stayed subdued, net responses have remained in the pessimistic zone due to uncertainty in economic activity, with CCI slip from 26.25% (April) to 10.5% (May) perceiving a worsening of the employment scenario in Nagaland. In contrast, expectations regarding the future employment situation remained buoyant, with more half of the respondents expressing downfall on future employment which largely co-moved with the income of the household (refer table 5).

Households' assessments about current income levels have continued to remain sluggish, with no improvement perceived since July 2020. This has closely co-moved with their perceptions on the employment situation–during the survey between March 2020 and May 2021, CCI fall from 26.83% to 5.25% shows that the employment situation has worsened as compared with the previous year and that their income levels had, in fact, fallen. Respondents' level of optimism on future income has continued to dip in the early part of 2021.

The literature found that in most of the states of India, the consumer confidence index shows decline trends during the first wave of the COVID-19. At the point when the situation started to improve, the buyer confidence certainty record gives positive indication, yet it fell again when the coronavirus broke out again in 2021. Similar results have found in the study conducted in Nagaland during the month of March to April and May 2021. Furthermore, data of the consumer confidence index from different parts of districts of Nagaland explored the influence to the economy by the recurrent outbreaks of COVID-19. The study found that recurrent CCI is significantly correlated to the extent of recurrent COVID-19 outbreaks. Furthermore, changes in CCI show a clear positive correlation with the change of GDP. This indicates that strict and consistent prevention and control measures may be meaningful in improving the state economy (Rakovska 2020; Nguyen 2020).

These indicators also provide useful insights to wielders of monetary and fiscal policies who have to make decisions on modulating aggregate demand in the economy around the path of productive capacity in the economy in order to ensure macroeconomic stability (Olowofeso and Sani Doguwa 2012; Acemoglu and Scott 1994; Al-Eyd et al. 2009). The policy measures such as stay-at-home restrictions, containment zone, factors mobility restrictions and social-distancing may simultaneously affect household confidence and business activity through a supply and demand channel (Baker 2020; Van der Wielen 2020).

The impact of socio-economic determinants of COVID-19: First and second wave

In order to reduce the possible huge impact of the COVID-19 spread, Nagaland government has implemented restrictions on human mobility, containment zone, social distancing and partial stay-at-home measures such as closure of educational institutions, offices, transportation, restaurants, hotels and shopping malls. In the most severe cases there was even stay-at-home order–all citizens were prohibited from leaving their homes for economic activities. This subsequently led to a major economic breakdown: fall in trade and commerce activities, businesses went bust and people were left jobless (Coibion et al. 2020; Montenovo et al. 2020). A number of social and economic criteria have been identify as potential determinants for the practical range in the coronavirus outcome during this first wave and second wave of the pandemic. Because of widespread business closures, especially in lower income populations, state economies are expected to contract, leading to a dramatic rise in job losses, fall in labour income, poverty rates and income inequality (Mahler et al. 2020; Martin et al. 2020; McKibbin and Fernando 2020; Valensisi 2020; Jamir 2021a; Messner 2020). Nagaland economy was recovering from the first wave of the COVID-19 pandemic, the second wave hit, and its intensity, in terms of both COVID-19 death and stay-at-home, quickly put an end to Nagaland swift V-shape economic growth after the first wave. The second wave stay-at-home has been far less draconian than those imposed during the first wave, both geographically and in terms of the sectors affected. During the first wave, the stay-at-home was focused on both goods and services, with restriction on intra-state transport. The second wave, stay-at-home is primary focused on services. Consequently, the damage to economic growth from the second wave, while substantial, should be much less severe than during the first wave. Thus, the economy will not contract as deeply as the first wave, but recovery is deeply intertwined with health policy (McKee and Stuckler 2020).

Table 6
Explanatory variables, descriptions and sources

Independent variables	Definition	Source
Labour income	Work pay incorporates the wages of representatives and part of the pay of the independently employed.	Labour Commission of India
Poverty	Number of people living below poverty line	Field Survey Report 2021
Crude rate of spread	The crude rate of spread of diseases per 1000	Jamir, Chubakumzuk 2021
Population density	Measurement of population per unit area	Census, 2011, GOI
Human mobility	Human mobility is the investigation that depicts how people move inside an organization or framework	Keyfitz, Nathan 1973
Job losses	Situation in which people lose their job; Number of person unemployed per 1000	ILO Report
Household health care expenditure	Health expenditure consists of all expenditures or outlays for medical care, prevention, promotion, rehabilitation with the predominant objective of improving healthcare.	Health and Family Welfare, GOI
COVID-19 death	Demise because of coronavirus may not be credited to another sickness (for example malignant growth, diabetic) and ought to be checked autonomously of previous conditions that are associated with setting off a serious course of coronavirus.	WHO International guidelines for certification and classification of COVID-19 as cause of death

***Compiled by author

Table 7
Models results of independent and explanatory variables

Explanatory variables	Model A (First wave)		Model B (Second wave)	
	β coefficient	t-value	β coefficient	t-value
Constant				
Labour income (LI)	-6.27	-21.62**	-3.84	-11.01**
Below poverty line (BPL)	3.72	9.91*	8.85	13.49*
Crude rate of spread (CRS)	17.64	31.46***	126.31	47.22***
Population density	0.253	4.550*	2.938	10.52*
Human mobility (HM)	1.35	0.73**	3.48	1.07**
Job losses (JL)	-9.17	-17.51**	-6.22	-11.47**
Household health care expenditure (HHE)	1.67	7.26	2.40	15.30
COVID death (CD)	0.354	2.911***	0.865	13.25***
Adjusted R^2	96%		98%	

Source: Data from statistical handbook of Nagaland (2018); Field survey report 2021; Census of India (2011) Department of Health and Family Welfare, Government of Nagaland (2021); Author calculations; Independent variable: Total COVID-19 positive cases (TCCs); Significance: ***p < 0.001; **p < 0.01; *p < 0.05.

Explanatory variables in the multivariate regression models included labour income, poverty rate, crude rate of spread, population density, job losses, human mobility, health care expenditure and COVID-19 death. Regression analysis results established that the total number of cases for each districts is considerably moderated by the factors included in the model. In model A, explain 96% of the variance in the number of COVID-19 positive case in Nagaland, with labour income, job losses, population density, poverty and crude rate of spread being the most important factors. Therefore, in the model B also provide an explanation for 98% of the variance, with LI, CRS, JL, BPL and HHE being the most significant factors for COVID-19 positive. Moreover, human mobility (HM) is a statistically important factor for the TCCs in all the districts.

The findings highlights the districts having higher COVID-19 positive cases were showing fall in labour income and this has been observed highest in Dimapur, Tuensang, Peren, Mon, Mokokchung and Kohima during the first wave of pandemic. In second wave the highest fall in labour income were found in Dimapur, Kohima, Mon, Mokokchung, Zunheboto and Phek. The results show that every one unit increase in COVID-19 positive cases leads to fall in labour income by -6.27 and -3.84 time (refer table 7).

Another variable that was proved to be positively significant was the poverty. In model A positive results was found between total COVID-19 case and poverty rate. This domino effect tells us that every one unit increase of COVID-19 raises the poverty by 3.72 times being reported during the first COVID-19 wave. The study found that Mon, Tuensang, Peren, Dimapur and Longleng has higher poverty rate compare to others district, where more people live below the income line causing poverty rate to rise. Different phases of Nagaland stay-at-home up to the "first unlock" on 1 June had varying degrees of the opening of the economy, resulting in significant upward push in employment and income level and thus, lowering the poverty level. In model B also positive results was observed between total COVID-19 case and poverty rate. The results of second wave shows that Dimapur, Tuensang, Mon, Phek and Zunheboto experience the highest rise in the poverty rate. This ripple effect tells us that every one unit increase of COVID-19 raises the poverty by 8.85 times being reported during the second COVID wave.

The crude rate of spread of COVID-19 diseases during the first wave for the Nagaland was estimated to be 0.65 per thousand through the formula (25 March-25 July, 2020) and similar increases to 4.55 from 28 March-28 May, 2021. This gives us a probable number of people infected who travelled from other states and also within the state. Model A results was observed between total COVID-19 case and crude rate of spread. The findings tell us that every one unit increase in the crude rate of spread increases 17.64 more COVID-19 and 126.31 in model B.

Considering the spread of COVID-19 among districts, the models argue that districts with higher population density have the highest COVID-19 case levels in both the waves. These results tell us that every one unit increase in population density may increase 0.25 and 2.93 more COVID-19 cases being reported according to these models A and B.

The study found that districts having higher human mobility are showing higher traces of COVID-19 cases and this has been observed in Kohima, Dimapur, Tuensang, Mon and Mokokchung in both the waves. This contagion effect tell us that every one unit decline in the human mobility increases 1.35 and 3.48 more COVID-19 cases being reported according to these models A and B. This can be an important proxy to see how state can predict the scale of and prepare for a pandemic (refer table 7).

The sudden outbreak of COVID-19 has affected the entire world. To slow the spread of the contagious disease governments have enforced stringent social distancing and stay-at-home restrictions that have mostly shut down businesses activities and lay off

workers in jobs severely reduced demand for other businesses. The sharp reduction in economic activity associated with public health efforts to slow the spread of the COVID-19 virus is likely to result in thousands of workers losing their jobs and livelihoods, at least temporarily. It is well documented that the COVID-19 pandemic has resulted in large increases of job loss in many states. Nagaland is no exception: studies estimate that between 2.9 lakhs i.e., (34.7% of the working force including cultivators, agriculture labourers, daily wage earner and household industry workers) adults lost their jobs from March to May 2020, following the stay at home restrictions and the wide-scale suspension of economic activity (Business Standard 2020; Census of India 2011). This loss of employment had significant implications for people's access to economic resources. But concerns about state governments' inability to process so many claims in such a short period, combined with the fact that many workers are ineligible for unemployment benefits, has led to concerns that total job losses are being understated by these numbers. The results show that every one unit increase in COVID-19 positive cases led to rise in job loss by -9.17 times in first wave and -6.22 times in second wave.

Healthcare spending has seen a sharp rise during the second wave of the COVID-19. The results suggest that healthcare inflation in Nagaland has spiked due to higher treatment costs incurred by thousands of families in 2021. While healthcare costs increase moderately during the second wave of the hospitalisation costs, prolonged treatment duration and triggered by shortage. The rising cost of healthcare during the pandemic has severely impacted household income, mainly due to COVID and post-COVID treatment costs. The results show that every one unit increase in COVID-19 positive cases led to rise in household health care expenditure by 1.67 times in first wave and 2.4 times in second wave.

Although the death rate for SARS-CoV-2 infection (i.e., the total number of deaths in patients positive for SARS-CoV-2 divided by the total number of people with a positive test) is not high, in the first wave, but drastically rises in the second wave. The actual cause of death is also important in interpreting fatality rates. Respiratory failure is obviously the main cause, as was also the case in previous viral pandemics, such as the Spanish flu of 1918 (Ruan et al. 2020). COVID-19 is sometimes complicated by shock and multiple organ failure, but the real course of the disease is not yet well described. The COVID-19 death rate in the first wave was estimated to be 0.31 (25 March-25 July, 2020) and similar increases to 2.78 in the second wave from 28 March-28 May, 2021. The model show that every one unit increase in COVID-19 positive cases led to rise in death rate by 0.35 times in first wave and 0.86 times in second wave.

Moreover, given its intrinsic nature and related response policies, the crisis will likely impact on other Sustainable Development Goals (SDGs), especially in the health care facilities, inequalities of income, education as well as on gender equality. The gender dimension, in particular, intersects other axes of structural marginalization including economic status, as women tend to be over-represented in vulnerable occupational categories such as health personnel, daily wage earner and self employment (World Bank 2020).

Consumer price index and inflation rate with COVID-19 consumption baskets

The COVID-19 pandemic has led to stay-at-home restrictions, containment zone, factor mobility restrictions and social-distancing rules that are dramatically changing consumer expenditure patterns in all the districts of Nagaland. In particular, consumers are spending less on hotels, restaurants and recreation, while expenditures on food and other groceries items have increased in both absolute and relative terms. The COVID CPI inflation rate is higher than Pre-COVID CPI inflation because the index based on COVID weights gives more weight to main food items that have a positive inflation rate, and less weight to categories experiencing deflation (Seiler 2020; Cavallo 2020).

Table 8
Consumer price indices and rate of COVID inflation in first wave and second wave

Food items	CPI Index 2020	CPI Index 2021	Covid CPI Inflation (2020)	Covid CPI Weight 2021	Covid CPI Inflation (2021)
Food grains	108.09	115.63	8.09	7.53	6.97
Pulses	111.34	121.53	11.34	10.19	9.15
Meat, Fish and Egg	145.98	122.99	45.98	-22.99	-15.75
Milk, Sugar and Beverage	105.53	112.74	5.53	7.21	6.83
Vegetable Oils and Fats	116.12	132.57	16.12	16.45	14.16
Vegetables	117.43	122.94	17.43	5.50	4.69
Fruits	161.09	146.61	61.09	-14.48	-8.99
Food Index	111.83	120.51	11.83	8.68	7.76

Source: Author calculations

Table 8 shows that the Nagaland COVID CPI inflation rate was higher in March-August 2020, because there was more CPI weight in categories that had a positive inflation rate. In particular, the CPI inflation for "Essential Food items at Home" rose from 4.76% i.e., (Pre-COVID inflation rate) in 2019 to 11.83% in 2020, increasing by 7.07%. Although the magnitude of the bias changes over time, every single month has added more inflation pressure to the COVID CPI index, so that the impact on the inflation rate is already significant, as shown in the above table 8. In March to April and May 2021, COVID CPI index has a positive inflation rate, while the COVID CPI was still experiencing some deflation, the difference became larger, with the COVID CPI inflation rate falling by -4.07% by the end of May. The results reveal a significant positive impact of relatively stringent stay-at-home restrictions on overall essential food prices. The one category that showed remarkable increase in inflation at the start of the pandemic is the price of meats, fish and egg, vegetables, fruits, pulses, vegetable oil and fats spiked early on and remain high. In contrast, the COVID CPI inflation for meat, fish, egg vegetable oil and fats and fruits increased significantly compare to other food items in first wave of COVID-19 pandemic in many regions that were part of the high restriction areas compared to regions that had relatively low stay-at-home restrictions. Comparing to second COVID-19 wave which pick up the momentum by the end of March 2021, large difference was driven by a fall in meat, fish, egg, fruits and vegetables prices relative to first wave. The most conventional estimate suggests a 7.07% increase in essential food prices due to a relatively stricter form of stay-at-home restrictions in March-December 2020. Extending the analysis from April-May 2021, the overall food prices continued to inflate. By contrast, the COVID CPI inflation rate was considerably and consistently higher during the stay-at-home restrictions (Akter 2020; Ebrahimy 2020). One reason presented for this is a disruption in supply chains and therefore not a monetary phenomenon. But the economy has now more or less fully opened up; meaning disruption can't continue to be a valid reason. The changes in household consumption patterns during COVID-19 pandemic increased the inflation rate for both income groups, but the fact that low-income households spend relatively higher proportion on essential food items than non-food items. These findings imply that the cost of living for consumers is rising faster during the COVID-19 crisis. This can, in turn, have important welfare implications across different income groups.

Table 9
Household food items and COVID CPI inflation rate in Nagaland

Food grains	CPI Index 2020	CPI Index 2021	Covid CPI Inflation 2020	Covid CPI Weight 2021	Covid CPI Inflation 2021
Basmati rice (25 Kg)	110.20	118.37	10.20	8.16	7.41
Andhra rice	107.14	111.43	7.14	4.29	4.00
K.R.T Rice dubar (25 Kg)	113.25	118.07	13.25	4.82	4.26
Boiled rice	104.62	115.38	4.62	10.77	10.29
Massor dal (small)	109.52	119.05	9.52	9.52	8.70
Aarar dal	110.59	116.47	10.59	5.88	5.32
Moong dal	104.21	105.26	4.21	1.05	1.01
Chana gota	113.16	119.30	13.16	6.14	5.43
Peas gota matar (50 Kg)	113.04	122.17	13.04	9.13	8.08
Naga dal	125.00	165.38	25.00	40.38	32.31
Pork meat	159.09	113.64	59.09	-45.45	-28.57
Beef	166.67	138.89	66.67	-27.78	-16.67
Poultry	156.25	125.00	56.25	-31.25	-20.00
Fish	133.33	120.00	33.33	-13.33	-10.00
Egg	106.25	118.75	6.25	12.50	11.76
Mustard.Oil (1 litre)	131.82	163.64	31.82	31.82	24.14
Refined Oil (1litre)	116.67	145.83	16.67	29.17	25.00
Vegetable ghee	144.44	177.78	44.44	33.33	23.08
Palm oil	112.50	125.00	12.50	12.50	11.11
Milk Powder (1 Kg)	113.16	115.79	13.16	2.63	2.33
Tea (500 gram)	106.25	118.75	6.25	12.50	11.76
Sugar (small) S-30	104.48	112.04	4.48	7.56	7.24
Milk	120.00	120.00	20.00	0.00	0.00
Tomato (kharpetia)	130.00	120.00	30.00	-10.00	-7.69
Green Chilly (micro)	160.00	140.00	60.00	-20.00	-12.50
Bean (big)	125.00	162.50	25.00	37.50	30.00
Cabbage	133.33	150.00	33.33	16.67	12.50

Bringal	150.00	166.67	50.00	16.67	11.11
Bitter gound (big)	109.09	127.27	9.09	18.18	16.67
Cauliflower	137.50	162.50	37.50	25.00	18.18
Garlic (big)	114.29	117.86	14.29	3.57	3.13
Onion	71.43	78.57	-28.57	7.14	10.00
Potatoes	87.50	62.50	-12.50	-25.00	-28.57
Apple (1Kg)	228.57	214.29	128.57	-14.29	-6.25
Mangoes (1 Kg)	124.14	117.24	24.14	-6.90	-5.56
Kiwi (Kg)	120.00	100.00	20.00	-20.00	-16.67
Banana (bunch)	142.86	128.57	42.86	-14.29	-10.00
Orange	162.50	125.00	62.50	-37.50	-23.08
Grapes	165.22	152.17	65.22	-13.04	-7.89
Pomegranate	130.43	126.09	30.43	-4.35	-3.33
Lemon	375.00	325.00	275.00	-50.00	-13.33
Total	111.83	120.51	11.83	8.68	7.76

Source: KMC; DMC, 2020; 2021 and Market Survey Report, 2021Author calculations

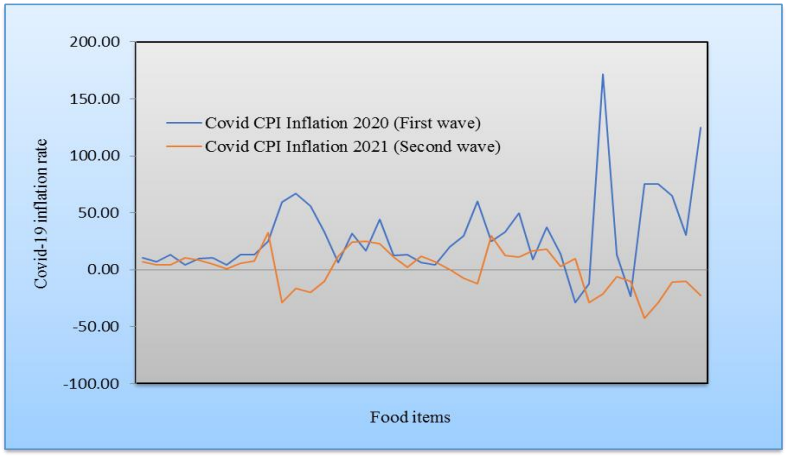

Fig. 2: Comparison of COVID CPI inflation first and second wave

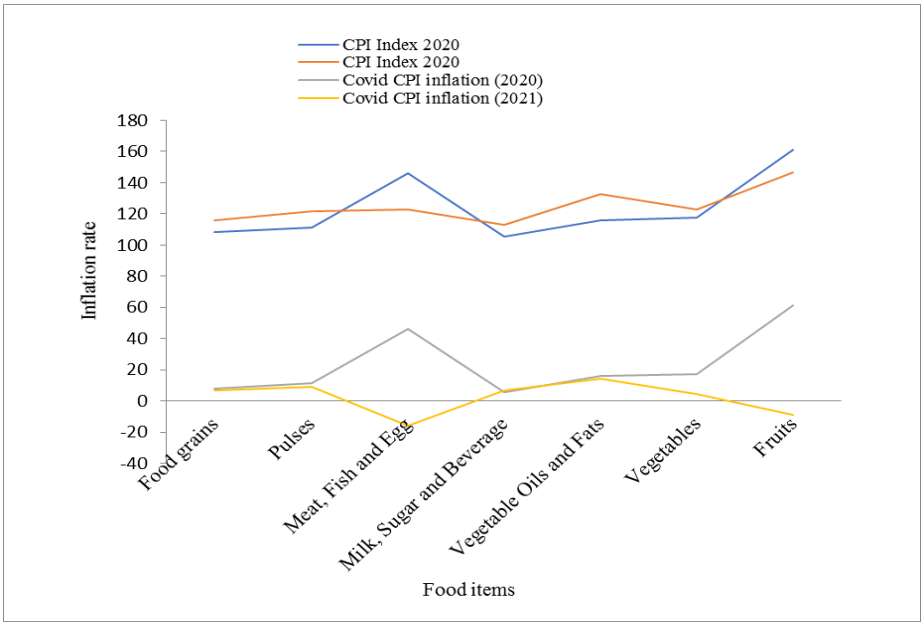

Fig. 3: COVID CPI inflation in first and second wave

8. Conclusions

This paper examines the transmission dynamics of the COVID-19 in Nagaland, considering within the districts. The data collected was comprises of first two month of COVID-19 waves i.e., 25 March to 25 May first wave, 2020 and 28 March to 28 May second wave 2021. Multivariate regression model in a cross-sectional framework has been used to study the determinants that contribute to the incidence of the pandemic. The domino effect exhibits that districts having higher population density are more affected by COVID-19 in both the waves. The results found that districts having larger human mobility from others districts have been more affected by COVID-19 diseases. Rather strategies such as stringent social distancing, contact tracing, testing and vaccine are signification to control the spread of diseases.

Therefore, people-centric plans and involvement of people participation are necessary to check the spread of virus. After only a few months of COVID-19 pandemic, the job losses were quite larger across population with different levels of education. In contrast, workers in jobs that require more face-to-face contact are at higher risk of job. Higher educated workers have had more job security during the pandemic because their work is often remote work compatible. There are gender differences in COVID-19 impacts on women working in unorganized sector. Women predict their income to fall in the next few months around 70% more than the income fall predicted by men. The least or uneducated workers have experience the worst situation during pandemic. Fighting poverty has been the objective of government strategy (Jamir 2021b; Jamir 2020; Jamir and Ezung 2017b; Jamir and Ezung 2017a; Ezung and Jamir 2018). The districts which are more poverty ridden are additionally affected with higher COVID rates. Though it is contrasting to findings of high-income districts are also more affected because of more economic activities and movement of people.

This study presents findings from a preliminary assessment of the impact of stay-at-home restrictions on food prices in Nagaland. Measuring and interpreting inflation is challenging during economic disruptions in general and the COVID-19 crisis in particular. Consumer spending is greatly affected by the pandemic containment measures, introducing a weighting bias into the measurement of COVID CPI inflation. By December 2020, the annual COVID inflation rate of essential food items was 11.83% (2020), compared to 4.76% (2019) of the CPI. This is a consequence of prolonged uncertainty, and the lifestyle adopted during the period of stay-at-home restrictions. In light of the fact that the CPI is an essential tool for economic policy making, the results have important implications for the crisis period and beyond. They provide evidence that conventional price measures have underestimated inflation during the crisis.

The study examine the COVID-19 pandemic had a rapid negative short-time effect on consumer-confidence and business-sentiment indicators, the evidence for a long-term effect was not so unambiguous. While the frequency of COVID-19 and indices of policy measures surged in the first and second-wave, business confidence and activity were hard hit. Consequently, it is not just business confidence but also household confidence which should be addressed in crises management. The main policy implication that emerged from the analysis is that till the availability of effective medical treatment (vaccine), the physical/social distancing, wearing masks, public and personal hygiene and good governance can save the population from both infections and fatalities.

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The author declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Statement

I solemnly declare: I abide by academic ethics, advocating rigorous style of study. This paper does not contain any published or written content by others.

Author Contribution

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