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THE EFFECTS OF CLIMATE CHANGE ON WOMEN'S HEALTH IN PAKISTAN

Muhammad Saeed Hashmi
Ex-Director of Agriculture (Economics & Marketing), Punjab, Lahore, Pakistan

Abstract
Climate change is a major issue that impacts human health. This study examined the relationship between women's health and shifting climatic trends in District Bahawalpur, Punjab, Pakistan. Convenience sampling was utilized to gather the data for this study, which employed logistic regression with a sample size of 175 married women. The results showed that married women are more likely to have good health than unmarried women. Women who experience smoke, smog, or blurred vision as a result of air pollution are more likely to have poor physical health. Women who are questioned at home are more likely to have better health as compared to those who are interviewed at work.
***Keywords**: Climate Change, Women's Health, Pakistan*

INTRODUCTION

Climate change is a condition of the climate that results from alterations in its features over a longer time span, often 10 years or more. Numerous socioeconomic, demographic, and environmental factors influence human health, which is defined as a state of complete physical, mental, and social well-being, free from illness or disease. Many people's physical and emotional health are impacted by the environment and other health-related factors. Clean water, fresh air, safe housing, and sufficient food supply are only a few of the environmental and social aspects of health that are impacted by climate change. The World Health Organization estimates that between 2030 and 2050, around 250,000 people would perish annually as a result of climate change. Land degradation, ocean ageing, the disruption or destruction of the ozone layer, soil degradation, freshwater resources, biodiversity stocks and organic framework functioning, and general nitrogen cycles are examples of Anthropocene environmental changes caused by human activity. In addition, deforestation and ocean expansion have increased Earth's warmth by lowering the threshold at which excess carbon dioxide is contained. Furthermore, regular exposure to heat and air pollution is an example of cosmological and geographical influences (Michael, 2013). One of the biggest threats to health is climate change. Rapid urbanization in developing nations and economic recovery are the main causes of climate change. There are serious health hazards associated with the development of urban areas as a result of climate change (Lendrum & Corvalan, 2007).

The concern over the potential effects of climate change on social cohesion and health has recently attracted attention (Dyer, 2010; Haider & Ali, 2015; Werrell & Femia, 2017; Sajid & Ali, 2018; Kassem et al., 2019; Roussel et al., 2021; Senturk & Ali, 2021; Mehmood et al., 2022; Guo et al., 2026). According to Barnett and Adger (2007), climate change is associated with negative health outcomes and social uncertainty, including fewer ecosystem services, reduced access to natural resources, altered lifestyles, and limited government ability to provide opportunities that support people's means of subsistence. Gleick (2014) and Guha-Sapir et al. (2018) connected the health effects of disputes and confrontations with climate change. For instance, up until 2016, the current conflict in Syria—which was partly exacerbated by drought—killed some 143,000 people.

Climate change may affect production capacity by reducing labour's working capacity. To work efficiently, abrupt changes in temperature are not suitable. It decreases labour efficiency by disturbing their health. Climate change is also disrupting native weather patterns through the prevalence of extreme weather events and consistently high temperatures that influence human health (Ahern et al., 2005; Ali & Audi, 2016). This study intends to empirically investigate the impact of climate change on human health in Pakistan, as it is a distressing factor for human health. Changes in weather and temperature are indicators of climate change. Various studies have shown that climate change negatively influences human health (Patil & Deepa, 2007; Kovats & Akhtar, 2008; Ali et al., 2021; Durani et al., 2026). In their examination, Patz et al. (2005) found that heat-related deaths and environmental change associated with more diseases are two principal climatic effects on wellbeing. The various dangers to human prosperity are because of the complex nature of natural change and its environmental and social signs. A three-route grouping of these risks and causal pathways is shown in Table 1.

The effects of environmental change on wellbeing are inseparable. Reducing environmental change is a necessary prime undertaking for the whole world. Nevertheless, governments keep on battling with this uncommon, complicated political and moral assignment; the more urgent challenge for the health sector is to

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recognise the fundamental local health risks caused by environmental change and implement the development of risk-reducing interventions (Michael, 2013; Ali, 2015; Audi & Audi, 2017). Climate change threatens to exacerbate Pakistan's already low health indicators (e.g., life expectancy, maternal and child mortality, malnutrition). The majority of Pakistan's population lives along the flood-prone Indus River, and diarrheal disease from contaminated water is a leading source of morbidity and mortality. Higher temperatures increase the risk of heatstroke. In 2015, an unprecedented heat wave with temperatures of 49°C killed more than 1,200 in Karachi**.** In 2010, unprecedented monsoon rainfall flooded 20 per cent of the country, affecting 21 million people and triggering infectious disease outbreaks and diarrheal illness due to contaminated drinking water and unhygienic conditions in makeshift camps (Baqir et al., 2012; Rehman & Ali, 2015; Audi et al., 2021). The climate risks to food safety, such as crop loss/failure, could also have consequences for malnutrition, which is already severe in Pakistan –almost half of all children are undernourished.

Table 1: Types of climate change **risks to health, according to causal pathway**

Risk Category	Causal Pathway
Primary	Direct biologic consequences of risky weather events, temperature-enhanced stages of urban air pollutants and heat waves.
Secondary	Risks mediated by changes in mostly food yields; biophysically and ecologically based processes and systems, infectious-disease vectors, (for zoonotic diseases) intermediate host ecology and water flows.
Tertiary	More diffuse effects (e.g., displaced groups, mental health problems in failing farm communities, minority ethnic groups and disadvantaged native) aftereffect of clash and tension owing to climate change–related decrease in basic resources (living space, water, timber, food).

Source: (Michael, 2013).

LITERATURE REVIEW

Proactive and preventive physician action and policy support at the individual and federal levels may include climate change advice on proper prevention and response (Bunyavanich et al., 2003; Asif et al., 2026). There was a strong and consistent relationship between outdoor air pollution and a short-term rise in hospital admissions for children (Barnett et al., 2005). Climate change would increase the frequency and intensity of heat waves. A number of interventions, such as improving living conditions, treating chronic diseases, and providing formal care for the elderly and the vulnerable, will need to decrease future impacts of heat (Kovats & Hajat, 2008). The literature shows that several human ailments, including morbidity, undernourishment, mortality, and infectious diseases, are associated with fluctuations in climate, such as extreme storms, heat, and cold (Patz et al., 1996; Stott et al., 2004). A study conducted by Omoruyi & Kunle (2012) indicated an increase in the risk of health and morbidity rates due to climate change. According to Khani et al. (2016), a 1 °C rise in maximum temperature in a given month was associated with a 15% increase in malaria incidence and a 19% increase in the same and succeeding month, with a significance value = 0.001.

Climate change and heat, in particular, can affect maternal and neonatal health outcomes (Kuehn et al., 2017; Asif et al., 2025). The 2010 floods affected 78 of 141 districts in Pakistan. They badly damaged the country's infrastructure and had long-term physiological and social impacts (Fatima & Rana, 2017). The strength of the positive relationship between temperature and various measures of mortality decreases with age (Husnain et al., 2017; Hashmi et al., 2025). Climatic changes adversely affect women's health (Ajaz & Majeed, 2018). Environmental stressors pose a threat to human mental health (Obradovich et al., 2018). Job and efficiency losses due to climate change have significant effects on the global supply of goods (Dally et al., 2018). The impact of CO2 emissions on health care has been comparatively greater, consuming higher health care expenses (Apergis et al., 1966-2009). Barreca (2011) found the distributional impacts of temperature and humidity on mortality for the United States. The study found that mortality rates decrease in cold and dry areas, but increase in hot and humid areas.

To mitigate the detrimental impact of climate change on Women's health, attention must be given to preventing changes in the physical environment caused by increased temperatures outside and inside homes and the discharge of toxic chemicals into the atmosphere. Although there is a lot of literature that focuses on climatic conditions and their associated effects on individual health, few studies have paid attention to women's health, particularly in Pakistan. In lower-income groups, women are more exposed to environmental problems because they perform household tasks as well as outdoor activities regardless of climatic conditions. To bridge this gap, this study focuses on women's health and how it is impacted by environmental changes. The main objective of this study is to study the changing climate patterns and their

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impact on the health of married women in District Bahawalpur, Pakistan. Oral consent was sought before initiation of data collection. Eventually, the research results would be beneficial for the collaborative organization, the society and the core department as well. The identity of respondents was not disclosed in any case.

METHODS AND DATA

To examine the climatic conditions that devalue human wellbeing. This study follows Ried and Ulrich's (1994) experimental model. The model takes the following structure.

$$Hi=\alpha i+\beta iXi+ui \quad (1)$$

Where Hi stands for self-rated physical health of women. On the other hand, vector Xi includes climate change, demographic and socioeconomic factors presented in Tables 2 & 3.

DATA SOURCE, COLLECTION AND TECHNIQUE

As the study is field-based research, the survey was conducted in the district of Bahawalpur. Data were collected through convenience sampling from the field through a closed-ended questionnaire. Oral consent was taken from each of the total 175 married female participants. The nature of this research is totally asymptotic based on the questionnaire. Verbal consent was sought before initiation of data collection. Table 2 provides a brief analysis of the data.

Table 2: Statistical Analysis

Sr.#	Description of variables	Mean	Std.Dev.	Minimum	Maximum
1	What is your current self-rated Physical Health?	0.66	0.47	0	1
2	What is your current marital status?	1.24	0.61	1	4
3	What is the gender of your household head?	0.72	0.45	1	0
4	What is your monthly household income?	3.10	1.24	1	6
5	Age (in complete years)	34.93	10.12	17	59
6	What is your current employment status?	3.42	1.01	1	4
7	Do you think you have enough food available for three meals a day?	3.79	0.94	1	5
8	What is your opinion on taking your Own health care decision?	1.48	0.50	1	2
9	What is the level of education of your husband?	2.96	1.70	1	7
10	Do the changing patterns of weather affect your health?	1.45	0.70	1	3
11	How much did your health get affected by the smoke/smog / blurred vision due to air pollution?	2.21	1.05	1	4
12	How much has your health been affected by the smell of air pollution?	2.16	1.01	1	4
13	How much did your health get affected by the noise pollution?	2.38	1.03	1	4
14	In your opinion, does your home ventilation affect your health?	0.61	0.49	0	1
15	Your health is exposed to which weather condition at high risk?	3.23	1.83	1	8
16	In your opinion, are other women likely or liable to be influenced or harmed by climate change?	0.72	0.45	0	1

RESULTS AND DISCUSSION

In univariate analysis, we presented the study variables with their number of occurrences (frequencies) and explored these variables through descriptive analysis using percentages and standard deviations; also, the Pie chart for each variable is presented for visual understanding of the data. Summary of the descriptive statistics of some variables is discussed in this section. It can be noted from Table 3 that out of the total 175 sampled female participants, only 59 women rated themselves as having poor health currently, which accounted for 33.70% of the total sample. However, 66.3% of respondents expressed their opinion about their current physical health as good health. It is worth mentioning that later, women were twice as likely as the participants with an opinion of having poor health, with a standard deviation of 0.47. Only 51.70% of women rated themselves as having their own health care decision currently; 48.30% of respondents do not have one. However, 67.40% of women's health was affected by changing weather patterns; however, 20.30% of respondents were not affected. 30.60% of women suffered a lot from smoke/smog/blur vision due to air

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pollution, whereas 34.30% suffered a little and 16.30% of respondents were not affected at all. Also, 30.60% of women were affected by the smell of air pollution a lot, 36.30% a little, 19.40% not very much, and 13.70% were not affected. Similarly,

24.30% of women were affected by the noise pollution a lot, 30.30% a little, 28.90% not very much, and 16.60% were not affected. The health of 38.60% of women was not affected by the absence of proper home ventilation, but 61.40% were affected. There were 9.10% of females only who admitted that they were affected by too much rain, 30.00% by low temperature, 39.40% by high temperature, 02.30% by floods, 04.90% by drought, 03.40% by short & intense rains, 05.70% by delay in rains, and 5.10% by dry spells. 28.30% of women were not harmed by climate change; however, 71.70% were harmed. It is worth mentioning that later, women were twice as many as participants who had an opinion about weather affecting them.

Table 3: Frequency Distribution (n=175)

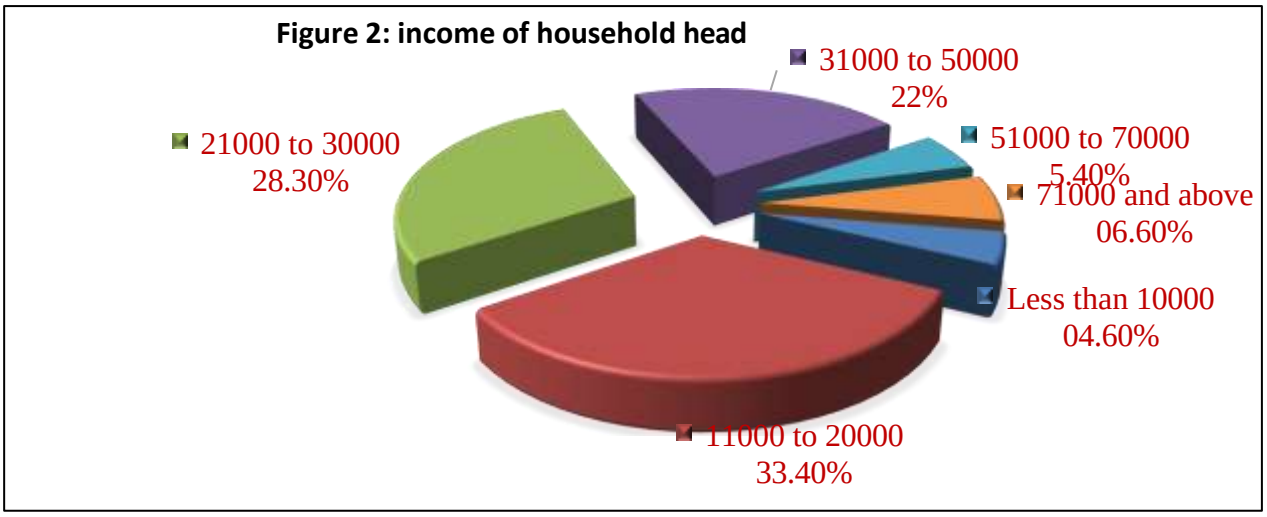
Sr.#	Description of variables	Categories	Frequency	%age
1	What is your current self-rated Physical Health?	Poor Health	59	33.70 %
		Good Health	116	66.30 %
2	What is your current marital status?	Married	147	84.00 %
		Widowed	17	9.40 %
		Divorced	9	5.10 %
		Separated	2	1.40 %
3	What is the gender of your household head?	Female	48	27.40 %
		Male	127	72.60
4	What is your monthly household income?	Less than 10000	8	4.60
		11000 to 20000	58	33.40
		21000 to 30000	50	28.30
		31000 to 50000	38	21.70
		51000 to 70000	10	5.40
		71000 and above	11	6.60
5	Age (in complete years)	Up to 27 Years	51	29.10
		28-33 Years	37	21.2
		34-41 Years	49	27.7
		Above 41 Years	38	22.0
6	What is your current employment status?	Government employee	19	10.60
		Private employee	12	6.90
		Self employed	22	12.90
		Housewife	122	69.70
7	Do you think you have enough food available for three meals a day?	Dissatisfied	5	2.90
		Uncertain	8	4.90
		Neutral	43	24.60
		Satisfied	80	45.40
		Very satisfied	39	22.30
8	What is your opinion on taking your Own health care decision?	Wife dominance	90	51.70
		Husband dominance	85	48.30
9	What is the level of education of your husband?	Primary or less	52	30.00
		Middle	21	12.00
		Matric	39	22.00
		Intermediate	27	15.40
		Bachelors	20	11.10
		Masters	13	7.70
		M.Phil. and above	3	1.70
10	Does the changing pattern of weather affect your health?	Yes	118	67.40
		No	35	20.30
		Do not know	22	12.30
		A lot	53	30.60

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11	How much has your health been affected by the smoke/smog/blur vision due to air pollution?	A little	60	34.30
		Not very much	33	18.90
		Not at all	29	16.30
12	How much has your health been affected by the smell of air pollution?	A lot	54	30.60
		A little	63	36.30
		Not very much	34	19.40
		Not at all	24	13.70
13	How much has your health been affected by the noise pollution?	A lot	43	24.30
		A little	53	30.30
		Not very much	50	28.90
		Not at all	29	16.60
14	In your opinion, does your home ventilation affect your health?	No	68	38.60
		Yes	107	61.40
15	Your health is exposed to which weather condition at high risk?	Too much rains	16	9.10
		Low temperature	52	30.00
		High temperature	69	39.40
		Floods	4	2.30
		Drought	9	4.90
		Short & intense rains	6	3.40
		Delay in rains	10	5.70
		Dry spells	9	5.10
16	In your opinion, are other women likely or liable to be influenced or harmed by climate change?	No	50	28.30
		Yes	125	71.70
17	In which area do you live?	Urban	105	59.70
		Rural	70	40.30
18	Place of interview	Household	72	41.10
		Hospital	78	44.60
		Others	25	14.30

GRAPHICAL REPRESENTATION

The variable income of household head portrays that out of the total 350 sampled female respondents, 16 (4.60%) women have a monthly household income of less than 10000 rupees, 99 (28.30%) women have a monthly household income of 21000 to 300000 rupees and so on (Figure 2).



On studying the respondent's demographic information, we found that there were 102 women (29.1% of the total sample) aged up to 27. 74 (21.2%) women were 28-33 years old, 97 (27.7%) women were 34-41 years old, and 77 (22.0%) women were aged above 41 years (Figure 3).

This section critically investigated the impact of predictor variables (categorical) on the response variable by using logistic regression. The brief summary of results is discussed below.

GOODNESS OF FIT MODEL

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For determining the goodness of the model, the following hypothesis was tested.

H0: Model is a good fit. **H1**: Model is not a good fit.

The Hosmer & Lemeshow statistic is used to test the null hypothesis that the fitted model is a good fit. Table 4 shows a high p-value for the chi-square statistic (0.439), indicating no evidence of poor fit. Thus, we can say that the fitted model is good.

The Nagelkerke R-Square value suggests that 32.1% of the variation in the response variable is explained by the explanatory variables incorporated into the model.

Figure 3: Age of Respondent



Table 4: Results of Goodness of Fit Test

Nagelkerke R-Square	Chi-squre	Degrees of freedom	Significance Value(p-value)
32.10	8.693	8	0.439

RESULTS OF LOGISTIC REGRESSION ANALYSIS

The results of logistic regression analysis in terms of odds ratio depicted that married women have 1.6 times more chances to have good physical health as compared to those women whose marital status is currently separated, with a p-value = 0.007 showing statistical significance of the variable current marital status, having a 95% confidence interval (0.165~64.557) for the odds ratio. The results are presented in Table 5. The results of logistic regression showed statistical significance (p-value = 0.043) of the variable age of women with a 95% confidence interval (1.234~7.343) for the odds ratio, suggesting that women of young age (less than 27 years) have 3.234% more chances to have good physical health as compared to those women who are aged greater than 41 years. Similarly, the variable current employment status was statistically significant (p-value = 0.015), suggesting that women working as Government employees have 2.61 times more chances of having bad physical health than women who are housewives. The 95% confidence interval was (3.607~5.255) for the odds ratio.

The availability of enough food for three meals a day is an interesting variable and was found statistically significant (p-value = 0.041) with 95% confidence interval (1.027~5.570) for the odd ratio suggesting that a women with three meals available a day will have 2.7 times more chances of having good physical health as compared to those women who do not have enough food available for three meals a day. The odds ratios of husband's education suggest that women married to husbands with education MPhil and above have 14.0% more chances of having good physical health as compared to those women whose husband's education is primary or less. A p-value of 0.029 shows statistical significance of the variable level of education of husband having a 95% confidence interval (1.077~16.962) for the odds ratio.

Women affected by smoke/smog/blur vision due to air pollution have 29.1 times more chances of having bad physical health compared to women who are not affected by smoke/smog/blur vision due to air pollution. This effect is statistically significant with a p-value = 0.038 95%. Bunyavanich *et al.* (2003) worked on Environmental change. According to them, anthropogenic changes, including air pollution and different ultraviolet radiation, affect and disturb the climate. There are 43.8 times more chances of women's health being affected by the smell of air pollution than women who have an opinion that their health is not affected (statistically significant with p-value = 0.007), having a 95% confidence interval (1.231~5.213) for the odds ratio.

There may be 18.8 times more chances of women who believe their health is affected by smell and noise

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pollution having bad physical health as compared to those women whose opinion is opposed (p-value = 0.023 with 95% confidence interval 1.414~3.459 for the odds ratio). Women with the opinion that their health is not affected by no proper home ventilation have 37.7 times more chances of having good physical health compared to those women whose opinion is opposed (p-value = 0.043 with 95% confidence interval 1.414~5.459 for the odds ratio). The results depicts that the odds ratio of 1.642 suggests that the condition of weather i.e. dry spells have 64.2% more chances to have a bad physical health as compared to those women whose opinion that their health is affected by too much rains with a p-value = 0.029 showing statistical significance of the variable exposed weather condition at high risk having 95% confidence interval (1.005~7.787) for the odd ratio. Also, women who have an opinion that other women are to be influenced or harmed by climate change have 10 times more chances of having good physical health as compared to those women whose opinion is opposed (p-value = 0.003, showing statistical significance, with a 95% confidence interval for the odds ratio).

This study revealed that women who reside in rural areas have 1.77 times more chances of having good physical health as compared to those women who belong to urban areas, with a p-value = 0.044 and a 95% confidence interval (1.398~2.495) for the odds ratio, showing statistical significance of the variable locality of women. Similarly, logistic regression analysis depicts that women interviewed at the household have 8.7 times more chances to have good physical health as compared to those women who were interviewed at the workplace, with a p-value = 0.009, showing statistical significance of the variable place of interview, with a 95% confidence interval (1.317~2.417) for the odds ratio.

Table 5: Results of Logistic Regression

Variables	Categories	Coeff.	*p*-value	Odds ratio
Constant	-	23.553	1.000	0.003
Marital status	Married	1.183	0.007	3.265
	Widowed	0.172	0.037	1.188
	Divorced	1.130	0.019	1.323
	Separated	Reference		
Gender of household head	Female	0.40	0.047	1.041
	Male	Reference		
Monthly household income	Less than 10000	Reference		
	11000 to 20000	1.090	0.009	1.914
	21000 to 30000	1.585	0.034	1.795
	31000 to 50000	1.866	0.008	2.378
	51000 to 70000	1.907	0.039	2.477
	71000 and above	2.260	0.018	1.771
Age (in years)	Less than 27	3.499	0.043	3.234
	Between 27 &33	3.441	0.046	3.456
	Between 33&41	2.905	0.049	3.671
	Greater than 41	Reference		
Current employment status	Government employee	1.485	0.015	3.616
	Private employee	1.092	0.016	2.335
	Self employed	1.998	0.015	1.369
	Housewife	Reference		
Enough food available for three meals a day	Dissatisfied	Reference		
	Uncertain	2.443	0.013	3.087
	Neutral	3.341	0.003	2.096
	Satisfied	1.149	0.016	2.317
	Very satisfied	1.426	0.041	1.653
Own health care decision	Wife dominance	Reference		
	Husband dominance	0.375	0.025	1.455
Level of education of husband	Primary or less	Reference		
	Middle	0.367	0.046	2.444
	Matric	1.001	0.037	1.011

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	Intermediate	2.379	0.048	1.685
	Bachelors	0.593	0.038	1.809
	Masters	1.971	0.027	2.640
	M.Phil. and above	1.131	0.029	1.140
Changing patterns of weather affect your health	Yes	Reference		
	No	1.404	0.032	1.498
	Do not know	1.437	0.033	1.646
Health affected by smoke / smog / blur vision	A lot	0.092	0.038	3.912
	A little	0.018	0.027	2.983
	Not very much	0.027	0.049	1.973
	Not at all	Reference		
Health affected by the smell	A lot	Reference		
	A little	0.008	0.049	3.008
	Not very much	0.087	0.019	2.091
	Not at all	0.092	0.007	1.096
Health affected by the noise pollution	A lot	Reference		
	A little	2.658	0.013	4.931
	Not very much	0.754	0.009	2.125
	Not at all	0.631	0.023	2.880
Effect of home ventilation	No	Reference		
	Yes	1.252	0.043	4.777
Health exposure to weather condition at high risk	Too much rains	Reference		
	Low temperature	0.634	0.045	5.884
	High temperature	0.002	0.049	3.998
	Floods	1.180	0.009	3.197
	Drought	1.196	0.013	2.302
	Short & intense rains	1.729	0.048	5.632
	Delay in rains	2.267	0.013	1.766
	Dry spells	0.496	0.029	1.642
Other women are likely or liable to be influenced or harmed by climate change	No	1.144	0.003	2.002
	Yes	Reference		
Locality	Urban	Reference		
	Rural	1.260	0.044	1.771
Place of interview	Household	1.133	0.009	1.876
	Hospitals	1.752	0.002	2.121
	Others	Reference		

CONCLUSION

The result of this study asserts that climate change and changing weather patterns have an unfavourable effect on married women's health. This research focused on the impact of changing climate patterns on women's health in District Bahawalpur, Punjab, Pakistan. This study used logistic regression and a sample size of 350 ever-married women. Results from univariate analysis revealed that, out of 350 sampled female participants, 66.3% of women had good physical health and 51.70% had their own health care decision-making. However, 67.40% of women's health was affected by changing patterns of weather, 30.60% of women suffered a lot due to air pollution, 39.40% were affected by high temperature, 02.30% by floods, 04.90% by drought, 03.40% by short & intense rains, 05.10% by dry spells and 71.70% were harmed by climate change. The results of the logistic regression analysis, in terms of the odds ratio, showed that married women are 3.265 times more likely to have good physical health as compared to women whose marital status is currently separate. Women affected by smoke/smog/blur vision due to air pollution have 3.912 times more chances to have bad physical health. The odds ratio is 1.642, suggesting that weather conditions, i.e., dry spells, have

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64.2% more chances to adversely influence physical health. Women from rural areas have 1.77 times more chances of having good physical health as compared to women who belong to urban areas. Women interviewed at the household have 1.88 times more chances of having good physical health compared to women who were interviewed at the workplace. This study concludes that changes in climate (increasing heat, dry spells, non-forecasted rains, and other factors) severely affect women's health. The results suggest a dire need for the Government and policymakers to focus on the factors influencing women's health affected by climate change in Punjab for better data-directed decisions. Our results show that climatic changes affect women (ever married) health badly. The Government should take the following steps to reduce health risks associated with climate change. Government should:

- Improve the climate by offering effective environmental policies.
- Encourage reforestation and the plantation in and outside homes.
- Increase green areas within urban localities.
- Create awareness to safeguard the people from the disastrous effects of the changing climate.

This study focused on changing climate patterns and the health of married women by conducting an empirical analysis for the District Bahawalpur using logistic regression. However, this work can also be extended in the following directions.

- This study can be extended by gathering data from all the cities of Punjab.
- The variables relating to some respiratory diseases can also be considered.
- Cluster analysis and Factor analysis techniques can be utilised for exploring and data-directed decisions.

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