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Original Article

Socio-demographic characteristics and their correlations with the vector-borne diseases in the Jazan region, Kingdom of Saudi Arabia

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ABSTRACT The vector-borne diseases (VBDs) can negatively affect not only public health in community but also, influence the community economy, life aspects, and quality. This study aims to examine the socio-demographics and evaluating people's knowledge and experiences about vector-borne diseases (such as dengue fever, and malaria). So, an online survey with 44 questions was built, and 521 participants completed it to seek the required information in Jazan region. Also, data were collected and analyzed with the level of Statistical significance (P-value) of less than 0.05. Statistical findings indicate varied results, such as the socio demographic factors (gender, age, place of living, working status) have a weak negative association with the frequency of mosquito bitten (r=-0.098), while in the education level factor there is a very weak positive correlation (r=0.090 to r=0.155) with all VBD variables. However, the study reveals that there is a significant very weak positive association between socio demographic factors (educational level) with all VBD variables, while the other factors (such as gender, age, place of living, working status) showed other various findings. Although this study is considered a regional study, it can be generalized in many countries worldwide.

Keywords: Dengue, Malaria, Vector-Borne Diseases (VBD), Socio-Demographic Characteristics, Jazan Region.

INTRODUCTION

One of the most serious threats in urban and rural communities in the world is Vector-borne diseases (VBDs). VBDs can affect negatively not only people's public health but also, they impact on the community economy, all life aspects and quality in any community, especially in tropical areas such as Jazan region which located in the southern area of the Kingdom of Saudi Arabia [1,2]. Dengue has a significant financial impact on the local economy, costing US$110.17 million year and costing an average of US$11 947.6 per patient. The prices were very variable between the various kinds of healthcare institutions, and productivity years lost accounted for almost 80% of the overall expenses.[15] Considering that half of the world's population is currently at risk, a few straightforward numbers highlight the significance of VBDs on a global level: an estimated 1 billion people get infected yearly, and more than 1 million die, making up 17% of the burden of infectious diseases worldwide[16].

In addition, altering exposure to the diseases by shifting geographic distributions, as previously mentioned, climate change could change the rate of transmission of vector-borne diseases. The responses of the vector and pathogen to changes in the specific range of temperature or moisture involved, as well as the immunological condition of the host population, determine how susceptible the disease is to changes in transmission rates.[2] Global change encompasses a variety of factors, including land usage, water storage and irrigation, urbanization and population expansion, trade and travel, and chemical contamination. While the threats posed by climate change to people and the environment remain unknown, other local changes are happening more quickly and are having a big impact on vector-borne diseases. [2]

The most prevalent mosquito-borne diseases in Saudi Arabia are Rift valley fever, dengue, filaria, malaria, and warrel's disease (Fakeeh and Zaki 2001, 2003; Ayyub et al. 2006; Khan et al. 2008). [17] Urban areas can serve as

breeding grounds for newly emerging and reemerging infectious diseases. Poverty, population movement, urban ecology, and microbiological adaptation to change are potential contributors to this [4, 5]. Cities and metropolitan regions are becoming "gateways for the worldwide spread of infections" since vector-borne diseases (VBD) are on the rise there. [18]. There is no doubt that climate change is occurring, and it is expected to cause the geographic distribution of many vector-borne diseases, such as malaria and dengue, to shift to higher latitudes and altitudes. Visceral leishmaniasis, filariasis, Japanese encephalitis, dengue, and malaria are the six primary vector-borne diseases (VBD) that are endemic to India.[19]

Both generalized additive models and generalized linear models were used for the geographical data's correlational analysis. Disease incidence was highly associated with average temperature, minimum temperature, and wind speed. In Cucuta, a region with a consistently high prevalence of dengue, the spread of Zika during the 2016 epidemic seems to have reduced dengue circulation. A negative influence on the spread of dengue, Zika, and chikungunya was suggested by socioeconomic issues such as barriers to health and children's services, inadequate sanitation, and poor water supply in all three habitats.[20]

Thus, in this study, an online questionnaire was carried out to find the prevalence of the most common vector-borne diseases (VBDs) in Jazan region (i.e., Dengue and Malaria) [5,6,7] as they are one of the major health problems in various places in both urban and rural areas, and people's knowledge about clinical symptoms of VBDs, impact on public health, VBDs breeding sites. Findings will be beneficial to help in estimating and detecting the occurrence probability of dengue fever and malaria, and their impact on the public health [3]. In this research, we explore the socio ecological model that includes community, environment, and predisposing factors of VBD occurrence and finding the association between socio demographic characteristics with vector borne disease variables.

MATERIALS AND METHODS

Sampling and data collection:

Data were collected via an online survey from April 2023 to May 2023. Participants were recruited via social network platforms such as Twitter, Instagram, Facebook, and WhatsApp. This study only allowed participants who were at least 18 years old, and from Jazan to be included. Incomplete answers were also excluded. About 521 participants took part but only 519 were qualified for inclusion. Ethical approval was provided by the Ministry of education.

Survey design

An online survey was built with 44 questions, 6 of these questions about the participants' socio-demographic characteristics (i.e., age, gender, occupation, accommodation type, area of living type, and education level) [8]. While the variables (the 38 questions) are about vector-borne diseases including mosquito massive breeding sites and weather variables, mosquito common breeding sites and water accumulation, prevalence of malaria and dengue in the Jazan region, kingdom of Saudi Arabia. These questions were designed as nominal data, and ordinal data that can be quantified and calculated statistically easily [9]. The ordinal data type, such as in the Likert scale [10], for example, 1 present (Least likely), while 5 (Most likely), or 1 present (Unlikely), while 5 (Very likely)), while the nominal data (such as YES or NO answers, or as gender type). These questions and their answers had mentioned in detail in (Tables 1, and 2) below.

Statistical analysis

Valid data were analyzed via suitable statistical analysis such as percents and correlation. To evaluate the association between the participants' socio-demographic characteristics and the variables (vector-borne diseases), SPSS (Statistical Package for the Social Sciences) software, version 26, was used, and the Statistical significance (P-value) of less than 0.05 was defined [11,12]. Also, to estimate the degree of association among the variables, we considered (Correlation Coefficient) r = 0-0.19 if the association is considered as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderate, 0.6-0.79 as strong and 0.8-1 as very strong correlation. Besides (-) indicates the negative association, and (+) indicates the positive association [13,14]. Answers obtained were either of ordinal data type (e.g., Likert scale) or nominal data type (e.g., YES or NO), and then were quantified and calculated statistically.

RESULTS

The results were illustrated as in (Tables 1,2, and 3) as follows. (Table1) illustrate an overview of the information about socio-demographic characteristics (as percentages and frequencies), (Table2) presents an overview of the information about vector-borne diseases frequencies, (Table 3) presents an overview of the information about correlations between socio-demographic factors with VBD variables.

Socio-demographic characteristics:

Table 1: Socio-demographic characteristics

Q. N	The Question	The answer	Frequency	Percent
1	Gander	Male	344	66.0
		Female	177	34.0
		Total	521	100.0
2	Age	From 18:19 years	19	3.6
		From 20:29 years	261	50.1
		From 30:39 years	69	13.2

		From 40:49 years	106	20.3
		More than 49 years	62	11.9
		Total	517	99.2
3	Educational level	High school diploma or less	116	22.3
		Bachelors	381	73.1
		Masters	12	2.3
		Doctorates	5	1.0
		Total	514	98.7
4	Working status	Student	182	34.9
		Government employee or private sector	237	45.5
		Unemployed	60	11.5
		Others	37	7.1
		Total	516	99.0
5	Place of living	City	349	67.0
		Close to the beach or sea	46	8.8
		Agricultural area	84	16.1
		Mountainous area	33	6.3
		Total	512	98.3
6	Type of Accommodation	Popular House	61	11.7
		Apartment	182	34.9
		Villa	218	41.8
		Others	56	10.7
		Total	517	99.2

(Table 1) shows that the surveyed participants sample consists of 344 males and 177 females. Among 521 participants there are 66% are males, and 34 are females. Among 517 participants, 50.1% were from 20:29 years, 20.3% from 40:49 years, 13.2% from 30:39 years, 11.9% more than 49 years, and 3.6% from 18:19 years. Among 514 participants, 74.1% have Bachelor, 22.6% have a high school diploma or less, and 3.3% have a Master. 1% have Doctorates. Among 516 participants, 45.9% work as government employees or the private sector, 35.3% work as students, 11.6% are unemployed, and 7.1% other. Among 512 participants, 68.2% live in a city, 16.4% live in an agricultural area, 9% live close to the beach or sea, and 6.4% live in a mountainous area. Also, among 517 participants 35.2 % live in an apartment, 42.2% live in a villa, 11.8 live in a popular house, and 10.8% live in other accommodations.

Table 2: The variables (vector-borne diseases) frequencies

Q. N	The Question	The answer	Frequency	Percent
1	How many times a week have you been bitten by a mosquito?	Twice or less per week	270	51.8
		From 3-5 times a week.	136	26.1
		From 6-7 times a week	96	18.4
		Total	502	96.4
2	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Home]	1 (Least likely)	195	37.4
		2	88	16.9
		3	58	11.1
		4	32	6.1
		5 (Most likely)	42	8.1
		Total	415	79.7
3	On a scale of 1 to 5, what places have you been bitten by mosquitoes (with 1 being the least likely and 5 being the most likely) [Work]	1 (Least likely)	177	34.0
		2	71	13.6
		3	37	7.1
		4	24	4.6
		5 (Most likely)	20	3.8
		Total	329	63.1
4	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Gardens]	1 (Least likely)	67	12.9
		2	37	7.1
		3	81	15.5
		4	103	19.8
		5 (Most likely)	126	24.2
		Total	414	79.5
5	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Beaches]	1 (Least likely)	87	16.7
		2	52	10.0
		3	79	15.2
		4	63	12.1
		5 (Most likely)	84	16.1
		Total	365	70.1
6	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Coasts]	1 (Least likely)	72	13.8
		2	52	10.0
		3	84	16.1
		4	64	12.3
		5 (Most likely)	70	13.4
		Total	342	65.6
7	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Others]	1 (Least likely)	92	17.7
		2	50	9.6
		3	47	9.0
		4	49	9.4
		5 (Most likely)	50	9.6
		Total	288	55.3
8	Had malaria or dengue fever within 3 years [I was medically diagnosed with malaria]	Yes	18	3.5
		No	480	92.1
		Total	498	95.6
9	Had malaria or dengue fever within 3 years [I was medically diagnosed with dengue]	Yes	29	5.6
		No	467	89.6
		Total	496	95.2
10	Had malaria or dengue fever within three years [a family member has been diagnosed with malaria]	Yes	20	3.8
		No	468	89.8
		Total	488	93.7
11	Had malaria or dengue fever within three years [a family member has been diagnosed with a fever or dengue]	Yes	42	8.1
		No	451	86.6
		Total	493	94.6
12	Had malaria or dengue fever within 3 years [a friend has been diagnosed with malaria]	Yes	44	8.4
		No	445	85.4
		Total	489	93.9
13	Had malaria or dengue fever within 3 years [a friend has been diagnosed with dengue]	Yes	77	14.8
		No	413	79.3
		Total	490	94.0
14	Had malaria or dengue fever within 3 years [a co-worker was	Yes	40	7.7
		No	443	85.0

	diagnosed with malaria]	Total	483	92.7
15	Have had malaria or dengue fever within 3 years [a co-worker has been diagnosed with dengue]	Yes	52	10.0
		No	441	84.6
		Total	493	94.6
16	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or none and 5 is very severe) Ignore the question if you have not been exposed [fever and tiredness]	1 (Mild or none)	192	36.9
		2	31	6.0
		3	37	7.1
		4	22	4.2
		5 (Very severe)	34	6.5
		Total	316	60.7
17	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or no and 5 is very severe) Ignore the question if you were not injured [back and muscle pain]	1 (Mild or none)	153	29.4
		2	41	7.9
		3	43	8.3
		4	31	6.0
		5 (Very severe)	24	4.6
		Total	292	56.0
18	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or no and 5 is very severe) Ignore the question if you have not been exposed [rash]	1 (Mild or none)	187	35.9
		2	40	7.7
		3	27	5.2
		4	14	2.7
		5 (Very severe)	16	3.1
		Total	284	54.5
19	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or none and 5 is very severe) Ignore the question if you were not injured [Inability to get out of bed]	1 (Mild or none)	167	32.1
		2	30	5.8
		3	38	7.3
		4	27	5.2
		5 (Very severe)	27	5.2
		Total	289	55.5
20	In your opinion, the possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [after it rains]	1 (Unlikely)	81	15.5
		2	51	9.8
		3	69	13.2
		4	96	18.4
		5 (Very likely)	187	35.9
		Total	484	92.9

In (Table 2), we can review the most important points in the following:

Mosquito bitten by number of times and by places:
Among the 502 participants, 51.8% people reported that 3-5 times a week they been bitten by a mosquito, and 19.1% of people reported that they have been bitten by mosquitoes 6-7 times a week. Among there are 47% people were reported that they have been bitten by mosquitoes at home and 53.8% of people reported that they have been bitten by mosquitoes at workplace and with gardens 30.4% were bitten, 23.8% at beaches, and coasts there are 24.6%, and other places are 31.9%.

Prevalence of Malaria and Dengue:
Similarly, 498(with 96.4%) of the people were not medically diagnosed with malaria within 3 years and 3.6% were diagnosed with malaria. Among, 496 (94.2%) of the people were medically not diagnosed with dengue while 5.8% were diagnosed with malaria. In 488 (95.9%) were reported that the family member has been not diagnosed with malaria while 4.1% were diagnosed with malaria. Among 493 participants, 91.5% reported that the family member has not been diagnosed with dengue while 8.5% were diagnosed. In 489, (91.5%) reported that a friend has not been diagnosed with malaria or dengue while 8.5% agreed that their friend has been diagnosed with malaria or dengue. Likewise, with 483 participants, 91.7% reported that their co-worker was not diagnosed with malaria while 8.3% agreed. In 493 participants, 89.5% reported that a co-worker was not diagnosed with dengue while 10.5% agreed.
Similarly, among 316 participants, 60.8% reported no fever and tiredness while 7% agreed. Among 292 participants, 52.4% reported they did not have back and muscle pain, while 8.3% agreed about severe back and muscle pain. Among 284 participants, 65.8% reported they did not have rash but 4.9% agreed about rash. Among 289 participants, 57.8% reported not for Inability to get out of bed while 9.3% reported for severity.

Table 3: The variables (mosquito breeding) frequencies

Q. N	The Question	The answer	Frequency	Percent
1	In your opinion, the possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [after it rains]	1 (Unlikely)	81	15.5
		2	51	9.8
		3	69	13.2
		4	96	18.4
		5 (Very likely)	187	35.9
		Total	484	92.9
2	In your opinion, the possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [when the temperature rises]	1 (Unlikely)	196	37.6
		2	94	18.0
		3	79	15.2
		4	31	6.0
		5 (Very likely)	37	7.1
		Total	437	83.9
3	In your opinion, the possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [at high humidity]	1 (Unlikely)	88	16.9
		2	94	18.0
		3	108	20.7
		4	72	13.8
		5 (Very likely)	80	15.4
		Total	442	84.8
4	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [conditioners]	1 (Unlikely)	147	28.2
		2	71	13.6
		3	68	13.1
		4	39	7.5
		5 (Very likely)	79	15.2
		Total	404	77.5
5	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [the farmer]	1 (Unlikely)	47	9.0
		2	33	6.3
		3	63	12.1
		4	103	19.8
		5 (Very likely)	220	42.2
		Total	466	89.4
6	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Gardens]	1 (Unlikely)	48	9.2
		2	33	6.3
		3	74	14.2
		4	109	20.9
		5 (Very likely)	199	38.2
		Total	463	88.9
7	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely	1 (Unlikely)	50	9.6
		2	25	4.8

	and 5 is very likely). [animal pens]	3	67	12.9
		4	97	18.6
		5 (Very likely)	205	39.3
		Total	444	85.2
8	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Vast lands where water gathers]	1 (Unlikely)	50	9.6
		2	34	6.5
		3	58	11.1
		4	101	19.4
		5 (Very likely)	230	44.1
		Total	473	90.8
9	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Wells]	1 (Unlikely)	59	11.3
		2	65	12.5
		3	92	17.7
		4	94	18.0
		5 (Very likely)	131	25.1
		Total	441	84.6
10	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [septic chamber openings]	1 (Unlikely)	44	8.4
		2	28	5.4
		3	63	12.1
		4	106	20.3
		5 (Very likely)	220	42.2
		Total	461	88.5
11	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Municipal water leaks in public places]	1 (Unlikely)	48	9.2
		2	35	6.7
		3	70	13.4
		4	107	20.5
		5 (Very likely)	201	38.6
		Total	461	88.5
12	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Sewage leaks]	1 (Unlikely)	49	9.4
		2	31	6.0
		3	74	14.2
		4	105	20.2
		5 (Very likely)	205	39.3
		Total	464	89.1
13	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [a goal or a sanitation station]	1 (Unlikely)	46	8.8
		2	32	6.1
		3	60	11.5
		4	107	20.5
		5 (Very likely)	213	40.9
		Total	458	87.9
14	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [garbage dumps]	1 (Unlikely)	41	7.9
		2	37	7.1
		3	66	12.7
		4	116	22.3
		5 (Very likely)	194	37.2
		Total	454	87.1
15	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [old car tires]	1 (Unlikely)	113	21.7
		2	93	17.9
		3	102	19.6
		4	51	9.8
		5 (Very likely)	81	15.5
		Total	440	84.5
16	In your opinion, the probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [empty soft drink cans]	1 (Unlikely)	109	20.9
		2	109	20.9
		3	96	18.4
		4	53	10.2
		5 (Very likely)	72	13.8
		Total	439	84.3
17	Are there any of these places near: [place of residence]	Yes	192	36.9
		No	278	53.4
		Total	470	90.2
18	Are there any of these places close to: [the place of residence of a relative and friend (whom you visit frequently)]	Yes	180	34.5
		No	262	50.3
		Total	442	84.8
19	Are there any of these places near: [your workplace]	Yes	102	19.6
		No	325	62.4
		Total	427	82.0

Mosquito breeding according to Season and climatic conditions:

Mosquito breeding according to seasons or climatic conditions, among 484 participants, 38.6% reported more breeding after it rains, while 10.5% reported less breeding. Among 437 participants, 44.9% reported for more breeding while the temperature rises and 7.1% were not agreed. In 442 participants, 24.4% reported for high breeding at high humidity while 10.5% not supported.

Mosquito breeding according to places:

Among 404 participants, 36.4% reported strongly about the probability of breeding places in containers, while the least reported with 9.7%. In 466 participants, 47.2% reported for the breeding place as farms while the least support with 7.1%. Among 463 participants, 43% agreed the probability of mosquito breeding place at Gardens, while the least with 7.1% of not agree. For the probability of breeding at Animal pens, among 444 participants, 46.2% agreed, while 5.6% did not agree. In Vast lands where water gathers, among 473 participants, 48.6% were agreed while 7.2% did not agree. Among 441 participants, 29.7% reported that the probability of breeding at wells while 13.4% did not agree. Among 461 participants, 47.7% reported positive for the probability of breeding at septic chamber openings but 6.1% were not. Among 461 participants 43.6% agreed that mosquito breeding may happen at Municipal water leaks in public places while 7.6% did not agree. For the place of Sewage leaks among 464 participants, 44.2% agreed while 6.7% did not agree. For the place of sanitation station among 458 participants, 46.5% reported as agree while 7% did not agree. In place of Garbage dumps, among 454 participants, 42.7% agreed, while 8.1% did not agree. In place of Old car tires, among 440 participants, 25.7% agreed, while 11.6% did not agree. In the Empty soft drink cans, among 439 participants, 24.8% agree while12.1 does not agree.

Likewise for the breeding of mosquitoes the place of residence, among 470 participants, 59.1%, did not agree while 40.9% agreed. For the Place of residence of a relative and friend (whom you visit frequently)], among 442 participants, 59.3% reported disagree, while 40.7% agreed. In workplace, among 427 participants, 76.1% reported disagree while 23.9% agree.

Table 4: Correlations between socio-demographic characteristics and the variables (vector-borne diseases)

Q. N	The question	Test	Gender	Age	Educational level	Working status	Living Place	Accommodation
1	How many times a week have you been bitten by a mosquito?	Correlation Coefficient	-.098*	.116**	0.021	.097*	.180**	-0.062
		Sig. (1-tailed)	0.014	0.005	0.317	0.015	0.000	0.084
		N	502	501	498	499	496	500
2	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Home]	Correlation Coefficient	0.037	0.044	0.054	-0.032	.112*	-0.062
		Sig. (1-tailed)	0.225	0.185	0.139	0.261	0.012	0.105
		N	415	414	412	412	410	413
3	On a scale of 1 to 5, what places have you been bitten by mosquitoes (with 1 being the least likely and 5 being the most likely) [Work]	Correlation Coefficient	0.068	.145**	-.114*	0.088	0.009	-0.054
		Sig. (1-tailed)	0.109	0.004	0.019	0.056	0.436	0.167
		N	329	328	328	327	326	327
4	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Gardens]	Correlation Coefficient	-0.017	-0.079	-0.028	0.019	0.056	-0.077
		Sig. (1-tailed)	0.364	0.054	0.289	0.351	0.129	0.058
		N	414	413	410	411	408	412
5	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Beaches]	Correlation Coefficient	0.064	0.038	0.024	0.059	0.046	-0.047
		Sig. (1-tailed)	0.110	0.235	0.325	0.131	0.191	0.188
		N	365	364	362	363	363	363
6	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Coasts]	Correlation Coefficient	0.064	0.051	0.030	.116*	-0.016	-0.031
		Sig. (1-tailed)	0.119	0.173	0.292	0.016	0.382	0.286
		N	342	341	340	340	340	340
7	On a scale of 1 to 5, what places have you been bitten by mosquitoes (1 being the least likely and 5 being the most likely) [Others]	Correlation Coefficient	-0.075	0.041	-0.027	.151**	-0.010	-0.048
		Sig. (1-tailed)	0.102	0.244	0.322	0.005	0.432	0.209
		N	288	287	287	286	285	287
8	Had malaria or dengue fever within 3 years [I was medically diagnosed with malaria]	Correlation Coefficient	0.023	0.029	0.042	-0.058	0.051	-0.024
		Sig. (1-tailed)	0.306	0.256	0.173	0.099	0.131	0.300
		N	498	496	493	495	491	496
9	Had malaria or dengue fever within 3 years [I was medically diagnosed with dengue]	Correlation Coefficient	0.012	0.052	0.013	0.036	-0.002	-0.004
		Sig. (1-tailed)	0.397	0.126	0.390	0.211	0.480	0.466
		N	496	494	491	493	489	494
10	Had malaria or dengue fever within three years [a family member has been diagnosed with malaria]	Correlation Coefficient	.080*	0.004	0.007	-0.023	-0.054	0.072
		Sig. (1-tailed)	0.039	0.465	0.443	0.305	0.120	0.058
		N	488	486	483	485	481	486
11	Had malaria or dengue fever within three years [a family member has been diagnosed with a fever or dengue]	Correlation Coefficient	-.094*	-0.003	-0.018	-0.013	0.020	0.026
		Sig. (1-tailed)	0.018	0.471	0.349	0.390	0.334	0.282
		N	493	491	488	490	486	491
12	Had malaria or dengue fever within 3 years [a friend has been diagnosed with malaria]	Correlation Coefficient	.115**	-0.065	-0.025	-0.047	-0.057	0.029
		Sig. (1-tailed)	0.005	0.075	0.294	0.153	0.106	0.262
		N	489	487	484	486	482	487
13	Had malaria or dengue fever within 3 years [a friend has been diagnosed with dengue]	Correlation Coefficient	0.033	-0.013	0.003	0.053	-0.056	0.000
		Sig. (1-tailed)	0.234	0.389	0.471	0.121	0.109	0.496
		N	490	488	485	487	483	488

14	Had malaria or dengue fever within 3 years [a co-worker was diagnosed with malaria]	Correlation Coefficient	.100*	-.085*	0.014	-0.059	0.037	-0.046
		Sig. (1-tailed)	0.014	0.031	0.384	0.098	0.209	0.156
		N	483	481	478	480	476	481
15	Had malaria or dengue fever within 3 years [a co-worker has been diagnosed with dengue]	Correlation Coefficient	0.049	-.127**	-0.038	-0.072	0.033	-0.044
		Sig. (1-tailed)	0.139	0.002	0.204	0.055	0.236	0.166
		N	493	491	488	490	486	491
16	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or none and 5 is very severe) Ignore the question if you have not been exposed [fever and tiredness]	Correlation Coefficient	-.093*	-0.023	0.076	-0.013	.125*	-0.046
		Sig. (1-tailed)	0.049	0.341	0.090	0.411	0.014	0.209
		N	316	314	313	314	312	315
17	In case of injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or no and 5 is very severe) Ignore the question if you were not injured [back and muscle pain]	Correlation Coefficient	-0.065	-0.015	0.090	0.007	0.061	-0.043
		Sig. (1-tailed)	0.135	0.399	0.064	0.452	0.152	0.230
		N	292	290	289	290	288	291
18	In the event of an injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or no and 5 is very severe) Ignore the question if you have not been exposed [rash]	Correlation Coefficient	-0.089	-0.071	.102*	0.021	0.033	0.017
		Sig. (1-tailed)	0.068	0.116	0.045	0.362	0.294	0.386
		N	284	282	281	282	280	283
19	In the event of an injury, to what extent was the disease affected? Choose from 1 to 5 (where 1 is mild or none and 5 is very severe) Ignore the question if you were not injured [Inability to get out of bed]	Correlation Coefficient	-0.066	-0.023	0.089	-0.005	0.040	-0.030
		Sig. (1-tailed)	0.131	0.351	0.066	0.466	0.251	0.308
		N	289	287	286	287	285	288
20	1_ In your opinion, the possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [after it rains]	Correlation Coefficient	0.001	0.070	.110**	0.054	.164**	-0.043
		Sig. (1-tailed)	0.489	0.062	0.008	0.118	0.000	0.174
		N	484	482	479	481	478	482
21	Possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [when the temperature rises]	Correlation Coefficient	-0.001	0.036	.082*	.080*	.088*	0.007
		Sig. (1-tailed)	0.494	0.224	0.044	0.049	0.034	0.446
		N	437	435	434	434	430	435
22	Possibility of mosquito breeding according to seasons or climatic conditions, (where 1 is unlikely and 5 is very likely). [at high humidity]	Correlation Coefficient	0.070	-0.015	.080*	0.050	0.027	0.065
		Sig. (1-tailed)	0.071	0.373	0.047	0.148	0.290	0.087
		N	442	440	437	439	436	440
23	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [conditioners]	Correlation Coefficient	0.012	.124**	.151**	0.041	0.043	0.010
		Sig. (1-tailed)	0.408	0.006	0.001	0.206	0.196	0.419
		N	404	402	402	402	399	402
24	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [the farmer]	Correlation Coefficient	0.064	0.018	0.055	0.007	.121**	-0.072
		Sig. (1-tailed)	0.083	0.351	0.121	0.437	0.005	0.061
		N	466	464	462	463	459	464

25	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Gardens]	Correlation Coefficient	.077*	0.047	0.037	0.038	.114**	-0.023
		Sig. (1-tailed)	0.050	0.155	0.216	0.211	0.007	0.309
		N	463	462	459	460	456	461
26	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [animal pens]	Correlation Coefficient	0.066	0.077	0.056	.112**	.101*	-0.050
		Sig. (1-tailed)	0.082	0.052	0.121	0.009	0.018	0.148
		N	444	442	441	442	437	442
27	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Vast lands where water gathers]	Correlation Coefficient	0.015	0.029	.091*	0.072	.100*	0.012
		Sig. (1-tailed)	0.376	0.262	0.025	0.060	0.016	0.398
		N	473	471	469	471	467	471
28	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Wells]	Correlation Coefficient	0.048	.127**	0.046	.127**	0.015	0.008
		Sig. (1-tailed)	0.158	0.004	0.168	0.004	0.380	0.430
		N	441	439	437	439	435	439
29	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [septic chamber openings]	Correlation Coefficient	0.048	0.024	-0.004	0.034	0.037	0.031
		Sig. (1-tailed)	0.154	0.302	0.465	0.231	0.219	0.257
		N	461	459	457	459	454	459
30	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Municipal water leaks in public places]	Correlation Coefficient	0.061	0.037	0.058	0.016	0.030	0.042
		Sig. (1-tailed)	0.097	0.218	0.107	0.367	0.262	0.187
		N	461	459	457	459	454	459
31	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [Sewage leaks]	Correlation Coefficient	0.039	0.033	0.060	0.015	0.073	-0.002
		Sig. (1-tailed)	0.200	0.242	0.100	0.376	0.060	0.485
		N	464	462	460	462	457	462
32	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [a goal or a sanitation station]	Correlation Coefficient	0.043	0.073	0.026	0.057	0.058	-0.002
		Sig. (1-tailed)	0.179	0.060	0.287	0.112	0.110	0.486
		N	458	456	453	455	451	456
33	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [garbage dumps]	Correlation Coefficient	0.058	0.004	-0.026	0.076	0.037	0.034
		Sig. (1-tailed)	0.110	0.466	0.291	0.053	0.217	0.236
		N	454	452	450	451	447	452
34	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [old car tires]	Correlation Coefficient	0.017	0.077	.090*	0.039	0.070	0.004
		Sig. (1-tailed)	0.362	0.055	0.030	0.210	0.073	0.466
		N	440	438	436	438	433	438
35	Probability of mosquito breeding according to places, (where 1 is unlikely and 5 is very likely). [empty soft drink cans]	Correlation Coefficient	0.032	0.032	.097*	.080*	-0.048	0.014
		Sig. (1-tailed)	0.254	0.255	0.022	0.048	0.161	0.389
		N	439	437	435	437	432	437
36	Are there any of these places near: [place of residence]	Correlation Coefficient	.114**	-0.067	-0.031	-0.039	-0.062	-0.021
		Sig. (1-tailed)	0.007	0.075	0.253	0.199	0.091	0.322
		N	470	468	465	467	463	468
37	Are there any of these places close to: [the place of residence of a relative and friend (whom you visit frequently)]	Correlation Coefficient	.116**	-0.064	-0.008	-.106*	-.107*	-0.007
		Sig. (1-tailed)	0.007	0.090	0.435	0.013	0.013	0.444
		N	442	440	437	439	435	440
38	Are there any of these places near: [your workplace]	Correlation Coefficient	0.032	-.119**	0.043	-0.063	-0.022	-0.009
		Sig. (1-tailed)	0.254	0.007	0.188	0.096	0.328	0.425
		N	427	425	422	424	420	425

In (Table 4), we can review the answers to the following: all variables were estimated at P-Value less than 0.05. Also, we considered (Correlation Coefficient) r = 0-0.19 if the association is considered as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderate, 0.6-0.79 as strong, and 0.8-1 as very strong correlation. Besides (-) indicates the negative association, or (+) indicates the positive association. Also, all the answers do not correlate (including all the types of accommodation answers) except in the followings:

Correlation between VBD Variables with gender:
The correlation Coefficient value is -0.098, with a weak negative association for number of times a week been bitten by a mosquito. The correlation Coefficient is 0.080, with a very weak positive association for family member diagnosed with malaria within three years. Similarly, the correlation Coefficient is -0.094, with a very weak negative association. For a family member diagnosed with a fever or dengue. The correlation coefficient is 0.115, with a very weak positive association for a friend has been diagnosed with malaria and the correlation coefficient is 0.100, with a very weak positive association for a co-worker diagnosed with malaria. For fever and tiredness, the correlation coefficient is -0.093, with very negative association. The probability of mosquito breeding according to places at Gardens the Correlation Coefficient is 0.077, with a very weak positive association. For breeding near place of residence the Correlation Coefficient is 0.114, with a very weak positive association. For the places close to: the place of residence of a relative and friend the correlation Coefficient= .116, with a very weak positive association.

Correlation between VBD Variables with age:
With age, there are correlations (or associations) as in the followings:
The Correlation Coefficient is 0.116, with a very weak positive association for number of times mosquito bitten in a week. The Correlation Coefficient is 0.145, with a very weak positive association for workplaces bitten by mosquitoes. The Correlation Coefficient is -0.085, with a very weak negative association for a co-worker diagnosed with malaria within 3 years. For the probability of mosquito breeding according to places such as containers, the Correlation Coefficient is 0.124, with a very weak positive association. Similarly, for the probability of mosquito breeding according to places Wells is the Correlation Coefficient as 0.127, with a very weak positive association. For the breeding places at these places near your workplace, has the Correlation Coefficient value -0.119, with a very weak negative association.

Correlation between VBD Variables with education Level:
With the educational level, there are correlations (or associations) as in the followings:
The Correlation Coefficient is 0.102, with a very weak positive association for the event of an injury very severe and rash. The Correlation Coefficient is 0.110, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions, after it rains. The Correlation Coefficient= .082, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions when the temperature rises. Likewise, the Correlation Coefficient is 0.080, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions, at high humidity. For the probability of mosquito breeding according to places like conditioners the Correlation Coefficient is 0.151, with a very weak positive association. The probability of mosquito breeding according to places like Vast lands where water gathers has got the Correlation Coefficient as 0.091, with a very weak positive association. Similarly, the probability of mosquito breeding according to places like old car tires has the Correlation Coefficient as .090, with a very weak positive association. Also, the probability of mosquito breeding according to places empty soft drink cans has the Correlation Coefficient value 0.097, with a very weak positive association.

Correlation between VBD Variables with working status:
With the working status, there are correlations (or associations) as in the followings:
The Correlation Coefficient is 0.097, with a very weak positive association for number of times a week bitten by a mosquito. The Correlation Coefficient is 0.116, with a very weak positive association for the places bitten by mosquitoes was coasts. The Correlation Coefficient is 0.151, with a very weak positive association for the places bitten by mosquitoes are others. The Correlation Coefficient is 0.080, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions when the temperature rises. The Correlation Coefficient is 0.112, with a very weak positive association for the probability of mosquito breeding according to places at animal pens. The Correlation Coefficient= .127, with a very weak positive association for the probability of mosquito breeding according to places at Wells. The Correlation Coefficient is 0.080, with a very weak positive association for the probability of mosquito breeding according to places at empty soft drink cans. The Correlation Coefficient is -0.106, with a very weak negative association for any of these places close to the place of residence of a relative and friend (whom you visit frequently).

Correlation between VBD Variables with Place of living:

With the place of living, there are correlations (or associations) as in the followings:

The Correlation Coefficient is 0.180, with a very weak positive association for the number of times a week bitten by a mosquito. The Correlation Coefficient is 0.112, with a very weak positive association for the places where bitten by mosquitoes at Home. The Correlation Coefficient is 0.125, with a very weak positive association for what extent the disease affected fever and tiredness. The Correlation Coefficient is 0.164, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions after it rains. The Correlation Coefficient is .088, with a very weak positive association for the possibility of mosquito breeding according to seasons or climatic conditions when the temperature rises. The Correlation Coefficient is 0.121, with a very weak positive association for the probability of mosquito breeding according to places the farmer. The Correlation Coefficient is 0.114, with a very weak positive association for the probability of mosquito breeding according to places at Gardens. The Correlation Coefficient is 0.101, with a very weak positive association for the probability of mosquito breeding according to places at animal pens. The Correlation Coefficient is 0.100, with a very weak positive association for the probability of mosquito breeding according to places in Vast lands where water gathers. Similarly, the Correlation Coefficient is -0.107, with a very weak negative association for there any of these places close to: the place of residence of a relative and friend (whom you visit frequently).

DISCUSSION

Disease incidence was lower in Bello, where the poverty index was low. Socioeconomic issues that have been linked to the spread of disease include substandard housing, inadequate sanitation, inadequate water supply, and barriers to health and children's services. Consequently, the risk of disease, as they are expanding their geographic range due to climate change. Arboviral epidemiology is further confounded by humanitarian crises (such as the political and economic unrest in Venezuela that has resulted in mass migration) and the COVID-19 pandemic, which emphasizes how urgent it is to comprehend for understanding the dynamics of these global health problems [20]. In the rural villages of northwest Ethiopia, the frequency of self-reported vector-borne diseases was significant. The low prevalence was linked to the family head, routine cleaning of the living space, and the cleanliness of the floor. This is due to the fact that most vector-borne diseases can readily be caused by their causative agents when a floor is dirty, and that a clean floor is not conducive to the growth of vectors [22]. In Thailand, sociodemographic and water management parameters had varying degrees of influence on the development of immature Ae. aegypti. In suburban Laos, there were very few statistically significant relationships between the generation of immature Ae. aegypti and socio-demographic and water management variables. Since the rural village was a uniformly underprivileged, uneducated agricultural population, it was not included in the comparisons [23].

The current study revealed the association between the VBD variables and socio demographic attributes. It shows that there is a significant weak negative association between the socio demographic factors (gender, age, place of living, working status) and VBD variables like frequency of mosquito bitten, a family member diagnosed with fever or dengue and fever and tiredness, place of residence of a relative and friend, a co-worker diagnosed with malaria and the probability of mosquito breeding in your workplace.

The socio demographic factors (gender, age, place of living, working status) significantly have a very weak positive correlation with the VBD variables like family member diagnosed with malaria, a friend diagnosed with malaria, a co-worker diagnosed with malaria, how many times a week bitten by a mosquito, what places have been bitten by mosquitoes in workplace. The socio demographic factors (gender, age, place of living, working status) also have a very weak positive correlation with the probability of mosquito breeding according to places- wells, coasts and others, according to seasons or climatic conditions, like animal pens, Wells, empty soft drink cans. the probability of mosquito breeding according to places, places near place of residence, the place of residence of a relative and friend. The education level factor significantly very weak positive correlations with all VBD variables.

The study explored the impact of socio-demographic factors and climate variables with Vector borne disease variables on the distribution of diseases. Its original contribution was that it selected socio demographic factors shown any association with any VBD variables may induce any disease. The study identified which climate condition or seasons makes more risk for VBD diseases, by estimating where dengue vectors are more likely to occur given their suitability to climate conditions in terms of mosquito breeding and its severity. By estimating the chance of a vector occurring in a community, we could then assess the impact of socio-demographic and climate factors on the incidence of dengue and malaria. The results confirmed a very week positive association between socio-economic factors and VBD disease. Hence, our study suggested that the very weak positive correlation of education level and working status may reduce the occurrence of Vector borne diseases among the community. There is a very weak positive association for mosquito breeding according to the places with VBD. So, there is a possibility of putting

the community at risk. Designing and enhancing an intervention strategy for regular cleaning and environmental sanitation will be taken into consideration. Although many studies in many various countries are similar to this study, there are no sufficient studies that mentioned these issues in the Jazan region, the Kingdom of Saudi Arabia. However, this research is done in population of the Jazan region only, with somewhat a limited sample size, it was not done in many regions with larger sample sizes.

CONCLUSIONS

The correlation analysis between socio-demographic characteristics and vector-borne diseases reveals that there are either very weak but significant positive correlation between VBD variables and educational level. The other socio-demographic variables (gender, age, residence, working status) had very weak positive or negative correlations with VBD variables. The study's results have important implications for policymakers and public health practitioners. Targeted interventions, such as awareness campaigns, vector control programs, and improved access to healthcare, can be designed to address the specific needs of vulnerable populations. By considering the socio-demographic characteristics of communities, health authorities can develop more effective strategies to prevent and control vector-borne diseases, ultimately reducing the burden of these diseases on individuals, families, and society as a whole. These results, though from Jazan, could be generalizable to other tropical areas of the world and thus support wider public health measures.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all participants prior to their participation in the survey. All data were collected anonymously, and confidentiality was maintained throughout the study.

ETHICAL APPROVAL

Ethical standards were adhered to the requirement of Deputyship for Research & Innovation, Ministry of Education in Saudi Arabia and Jazan University (Project ISP22-14.).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS:

All authors contributed substantially to the conception and design of the study, data acquisition and analysis, interpretation of results, and manuscript preparation; all authors reviewed and approved the final version of the manuscript

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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