ORIGINAL ARTiCLE

KNOWLEDGE, ATTITUDES, PRACTICES AND PERCEPTIONS ABOUT ZIKA IN WOMEN OF CHILDBEARING AGE IN AMAZONAS, PERU

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ABSTRACT

Objective. To describe the knowledge, attitudes, practices, and perceptions about Zika in women of childbearing age (WCA) in the department of Amazonas in Peru, following a Zika outbreak. **Materials and methods.** Descriptive study with a mixed quantitative-qualitative approach. We carried out stratified sampling, by applying a survey to a sample of 723 WCA aged 15 to 49 years in the district of Bagua, department of Amazonas, then we carried out four focus groups with 35 WCA in each group. Frequencies and the grounded theory were used for quantitative and qualitative analysis respectively. Interpretation of both methods was integrated using a narrative approach. **Results.** We found that 86.3% of WCA knew that it is possible to get sick with Zika, 10.1% knew that it is transmitted through sexual intercourse, 2.2% knew that it can be transmitted during pregnancy and 68.5% consider that the information is insufficient. In practice, 60% (n=434) used mosquito nets, 53.4% (n=386) covered water containers and 7.3% (n=4) perceived local government involvement. Qualitative data showed distrust of vector control and expressed the need for psychological support for pregnant women and their families. **Conclusions.** There are gaps in the knowledge and practices of WCA regarding the prevention of sexual and vertical transmission of Zika; WCA distrust vector control, do not perceive local government involvement, suggest psychological support should be provided to pregnant women with Zika, as well as to mothers with disabled children, and wish to access more information about Zika.

Keywords: Knowledge; Attitudes; Practices; Prevention; Zika; Women of reproductive age (Source: MeSH NLM)

Cite as: Mateo SY, Guzmán-Cuzcano J, Peña-Sánchez ER, Yon C, Valderrama B, Carrasco J, et al. Knowledge, attitudes, practices and perceptions about zika in women of childbearing age in Amazonas, Peru. Rev Peru Med Exp Salud Publica. 2021;38(4):551-61. doi: https://doi.org/10.17843/rpmesp.2021.384.8558.

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Received: 14/06/2021
Approved: 01/12/2021
Online: 22/12/2021

INTRODUCTION

Zika is an arbovirus associated with severe sequelae such as congenital brain anomalies [1] or Guillain-Barré syndrome [2]. It is considered that the cost of the Zika epidemic in Latin America, in three years, was 7 to 18 billion dollars and that the long-term costs will be associated with the sequelae [3]. Furthermore, since its arrival into the continent, there has been an ongoing debate on reproductive rights versus the option of abortion, due to the potential sequelae in newborns [4].

The first native cases of Zika in Peru were documented in 2016. Sustained transmission has been observed in the department of Amazonas since the report of the first outbreak between 2017 and 2018 with cases in pregnant women and women of childbearing age (WCA) [5,6]. The main response interventions focused on intensifying actions against the *Aedes aegypti* vector [7] and recommended condom use and delaying pregnancy [8]. Given this type of measures, it is essential to know the perception, knowledge, attitudes and practices (KAP) of the community, especially

of WCA, in order to identify whether the recommendations were understood, accepted and practiced in this population and to allow rethinking strategies with scientific evidence.

Some studies describe the lack of knowledge regarding sexual transmission [9,10], age and schooling [11] as factors that could represent barriers to the prevention of Zika. Although low risk perception among pregnant women has been reported [12], there is limited information on the perceptions of WCA about the risk of disease and their attitudes regarding prevention measures implemented by the health sector and local governments. Therefore, our study aimed to determine the knowledge, attitudes, practices and perceptions of WCA about the disease, complications, interventions and recommendations implemented after a Zika outbreak in the department of Amazonas.

KEY MESSAGES

Motivation for the study: To determine if the recommendations on Zika prevention and control provided during an outbreak were understood, accepted and practiced by the WCA population.

Main findings: Lack of knowledge and limited prevention practices regarding sexual transmission of Zika were observed. Likewise, the WCA perceived little participation of the local government, distrust of vector control strategies and gave importance to psychological support to pregnant women and mothers with a disabled child.

Implications: Determining the knowledge, attitudes, practices and perceptions of WCA after a Zika outbreak allows redefining intervention strategies based on scientific evidence.

MATERIALS AND METHODS

Study design and population

Descriptive study, with a mixed quantitative-qualitative approach. It was conducted between November and December 2018 on WCA aged 15 to 49 years, residents of the district of Bagua, department of Amazonas. The district of Bagua is located in the northern jungle of Peru, at an altitude of 420 meters and has environmental characteristics that favor the presence of the *Aedes aegypti* vector [13].

For the quantitative approach, we developed a questionnaire based on the KAP survey on Zika and its complications for community settings by a multidisciplinary team of the World Health Organization (WHO) [14], which was made available for use in member countries. Since it is an instrument that has not been tested in the field, the WHO recommends the application of a pilot test. For our study, questions were selected according to the research objectives. The instrument was validated by four experts with experience in field epidemiology, epidemiological surveillance of congenital diseases and research. The review process included the evaluation of the questionnaire by using a rating card with six categories: sufficiency, congruence, wording, clarity-precision, relevance and pertinence of the items. A pilot test was also conducted in the city of Bagua Grande in the province of Utcubamba-Amazonas, with a non-probabilistic sample of 5% of the study sample (36 WCA), to adapt it to the context, improve the structure of the questions and determine the time required to fill out the instrument. At the beginning of the study, 40 questions were selected from the WHO survey that addressed the research objective. After review by the experts, five questions were ordered and reformulated. As a result of the implementation of the pilot test, three questions were removed, one question was added and the structure of question 19 was modified for better understanding. The final survey consisted of 38 questions, divided into four sections: sociodemographic data, knowledge, attitudes and practices; the average time to complete the survey was 15 to 30 minutes.

Subsequently, four focus groups were formed, using a semi-structured guide with 17 open-ended questions on perceptions of Zika. The average duration of each focus group was 60 to 120 min and was moderated by a professional with experience in qualitative research. The instrument was validated by expert judgment.

Sample and sampling

For the quantitative phase, we considered the estimated population of women aged 15-49 years in 2018 (6,862 WCA), published in the National Institute of Statistics and Informatics. An expected proportion of 50% (proportion of correct answers of knowledge and practices) was considered to obtain the maximum sample size, reliability level of 95%, margin of error of 5%, rejection rate of 0.1 and design effect of 1.8. The resulting sample of 721 women was calculated using Epidat 4.1 software (Xunta de Galicia- OPS).

The sampling was stratified by two-stage clusters, so a sample of subjects was selected for each sector of the district of Bagua (19 sectors). The first level unit was a random selection of blocks in each sector using the 2018 cadastral sketch of the District Municipality, proportional to the size of each cluster. The second level unit was the dwellings within each block and we randomly selected four dwellings per block. In each dwelling we sought for a WCA aged 15 to 49, if the subject was not found in the selected address, the

 https://doi.org/10.17843/rpmesp.2021.384.8558

next dwelling to the right was chosen.

For the qualitative approach, a non-probabilistic purposive sample of WCA who voluntarily agreed to participate in the focus groups was selected and the invitation was extended to all WCA during the application of the survey. The focus groups were formed according to their arrival; four groups were formed with a minimum of eight and a maximum of eleven WCA.

Data collection

The questionnaires were applied from November 26 to December 31, 2018. Previously, enumerators and supervisors were trained, in order to ensure the correct application of the instrument. There were twenty enumerators, distributed in each sector, and three supervisors who monitored six to seven enumerators in order to ensure the quality of the information collected. The survey was administered to WCA who were at home and who wished to participate in the study.

During the application of the survey each enumerator in charge of a sector made the invitation for the focus groups, seeking to include the entire rural and urban socioeconomic spectrum. From the 4th to the 7th of December 2018, four focus groups were carried out, each group had a moderator who used the semi-structured guide and led the focus groups. Likewise, there were two observers who recorded the field notes and the participants' responses through a voice recorder.

Study variables

The quantitative survey included, in addition to the sociodemographic variables, 16 questions on knowledge, 9 questions on attitudes and 15 on practices. For the collection of qualitative data, stimulation questions were used for five topics: dissemination of information about Zika, knowledge about the disease, prevention of the disease, consequences for the pregnant woman and complications of the disease.

Analysis plan

For the descriptive quantitative analysis, we used absolute and relative frequencies and measures of central tendency and dispersion (mean and standard deviation) for the categorical and numerical variables, respectively. The statistical software Stata version 12 (Stata Corp LLC, USA) was used.

The qualitative analysis included the extraction of key quotes that were coded and grouped into five sections: Dissemination of information, knowledge about the disease, prevention of the disease, consequences in pregnant women and complications due to Zika. For the analysis, we used the grounded theory methodology, based on the analysis of the content of the responses, seeking to elaborate an integrating theory to explain the perception of each topic.

The quantitative-qualitative integration was carried out in the data interpretation phase, by using narrative integration with a constructive approach (weaving approach) [15]. The integration followed the interpretation of the five sections, allowing to broaden, deepen and contextualize the study findings.

Ethical aspects

The study was approved by the Ethics Committee of the Hospital Nacional Dos de Mayo- Lima (evaluation 093-2018-CEIB- HNDM). All participants signed an informed consent form before the application of the survey and the focus group, after being informed of the purpose, risks and benefits of the research. Likewise, an informed consent form was used for underage participants. The data recorded in the instruments were anonymous in order to protect the participant's identity and privacy.

RESULTS

A total of 723 WCA were surveyed, the mean age was 31.8 years with a standard deviation (SD) of 8.9 years; 75.8% (n=548) were housewives, 45.8% (n=331) completed at least secondary school, 53.9% (n=389) were cohabitants, 62.5% (n=449) were Catholic and 87.4% (n=632) were from urban areas. From the total WCA surveyed, 4.4% (n=32) were pregnant women and the average monthly income was 781 soles (Table 1). The four focus groups included 35 WCA between 17 and 49 years of age (three groups of eight and one group of eleven) from the district of Bagua, none of whom reported being pregnant.

Knowledge about the disease

Regarding knowledge, 86.3% (n=624) considered that it is possible to become ill with Zika; 35.6% (n=257) believed that it can cause a rash; 10.1% (n=73) that it can be transmitted through sexual intercourse and 2.2% (n=16) that it can be transmitted during pregnancy. A total of 97.1% (n=702) of the WCA would advise a patient with Zika to go to a health facility. Regarding practices, 94.2% (n=681) reported that if they had a rash, they would go to the health facility (Table 2).

In the focus groups, we found that Zika is perceived as "similar" to dengue and they consider that it "affects pregnant women". Most of them relate transmission to the bite of the "mosquito". However, some recognize transmission during pregnancy (Annex 1).

Table 1. Sociodemographic characteristics of women of childbearing age, Bagua district, Amazonas department.

Sociodemographic characteristics	(n=723)	%
Age*	31.8	8.9
Pregnant		
No	691	95.6
Yes	32	4.4
Occupation		
Housewife	548	75.8
Student	73	10.1
Vendor	22	3.0
Other	80	11.1
Educational level		
Illiterate	14	1.9
Primary school	139	19.2
Secondary school	331	45.8
Higher	239	33.1
Religion		
Catholic	449	62.5
Evangelic	210	29.2
Atheism	25	3.5
Other	35	4.9
Marital status		
Single	203	28.1
Married	118	16.3
Cohabitant	389	53.9
Other	12	1.7
Monthly income [a]	781.3	544.9
Dwelling location		
Urban	632	87.4
Peri-urban	91	14.6
People living in the dwelling *	4.4	3.2
HCC where they attend		
Public	676	93.5
Private	17	2.4
None	17	2.4
Does not mention	13	1.8
Health insurance		
Yes	665	92.0
No	58	8.0
Type of insurance		
SIS	542	81.5
EsSalud	123	18.5
Does not mention	58	8.0
Distance to HCC [b]*	8.3	5.3

* Mean ± SD. a cost in soles. b time in minutes. SIS (Integral Health Insurance). HCC. (Healthcare center).

Table 2. Knowledge, attitudes and practices on general aspects of Zika disease in women of childbearing age, Bagua district, Amazonas department, Peru.

General aspects of Zika	(n=723)	%
Knowledge		
Do you think it is possible to get sick with Zika?		
Yes	624	86.3
No	88	12.2
Does not know	7	1.0
Maybe	4	0.6
How can you get Zika? *		
From a mosquito bite	667	92.3
Sexual intercourse	73	10.1
Does not know	40	5.5
From blood transfusion	18	2.5
Mother-to-child transmission	16	2.2
Other	5	0.7
Do you know the symptoms of Zika? *		
Fever	596	82.5
Headache	500	69.2
General malaise	293	40.5
Rash	257	35.6
Conjunctivitis	119	16.5
Does not know	65	9.0
Other	15	2.1
Attitude		
If someone around you gets sick with Zika, what do you think you should do?		%
Instruct him/her to go to the HCC	702	97.1
Does not know	11	1.5
Do nothing or walk away	10	1.4
Practices		
If you had a rash all over your body and intense itching, what would you do? *		%
Go to the public HCC	681	94.2
Go to the pharmacy to buy medication or self-medicate	55	7.6
Stay at home and do nothing / do not take any medication.	13	1.8
Other	17	2.4

HCC. (Healthcare center), * multiple choice question, total does not add up to 100%.

Dissemination of information about Zika

Regarding information on Zika, 85.8% (n=620) of the WCA received information more than a year ago; 41.1% (n=297)

https://doi.org/10.17843/rpmesp.2021.384.8558

Table 3. Knowledge, attitudes and practices on Zika dissemination among women of childbearing age, Bagua district, Amazonas department, Peru.

Dissemination of information about Zika	(n=723)	%
Knowledge		
When did you first hear about Zika?		
More than a year	620	85.8
More than a month this year	72	10.0
In the las month	31	4.3
Attitude		
Do you think you have enough information about Zika?		
No	495	68.5
Yes	137	19.0
Maybe	81	11.2
Does not know	9	1.2
Does not mention	1	0.1
On what aspects would you like more information? *		
Prevention	347	48.0
Treatment	297	41.1
Signs and symptoms	246	34.0
Consequences of Zika during pregnancy	162	22.4
Causes of getting Zika	140	19.4
Does not know	47	6.5
Other	37	5.1
Practice		
Where did you hear? *		
Radio	297	41.1
HCC personnel	248	34.3
Television	171	23.7
Friends or neighbor	100	13.8
Health campaign	94	13.0
Family	39	5.4
Health agent	37	5.1
Community meeting	15	2.1
Social networks	13	1.8
Does not know or remember	13	1.8
Other	35	4.8

HCC: Healthcare center. * multiple choice question total does not add up to 100%.

heard it on the radio; 34.3% (n=248) through talks by health personnel and 23.7% (n=171) on television. Of the total of participants, 68.5% (n=495) considered that the information received is still insufficient and would like to obtain more information on prevention 48% (n=347) and treatment 41.1% (n=297) Table 3. In the focus groups, participants indicated that information on Zika was broadcasted "fast" on radio and television. On the other hand, they indicate that other dissemination strategies should be considered (Annex 1).

Disease prevention

WCA believe that Zika can be prevented by using mosquito nets 60% (n=434) and covering water containers 53.4% (n=386); 3.6% (n=26) believe it can be prevented by avoiding sexual intercourse and 1.9% (n=14) by using a condom. Of the participants, 36.1% (n=261) considered that families are responsible for preventing Zika, 27.3% (n=197) that the health sector is responsible, 16.5% (n=119) that local governments and 27% (n=195) believe that everyone is responsible. Regarding practices, 74.4% (n=538) of WCA reported having taken some measure to protect themselves and 81.8% (n=591) to protect their family. Fourteen percent (n=101) reported that they kept the sachet of larvicide in the container and 7.9% (n=57) allowed the health brigades to enter their home. On the other hand, only 4.4% (n=32) used condoms, 1% (n=7) avoided sexual intercourse and 0.6%(n=4) received education within their families; 84.2% (n=609) considered that the health sector had taken preventive measures, 67.6% (n=489) through focal (larval) control. Of the WCA, 7.6% (n=55) consider that the local government has carried out activities, of which 7.3% (n=4) have coordinated with the local healthcare center (Table 4). In the focus groups, they considered that the health sector continues to do the "same thing", they are suspicious of the impact of the new larvicide for focal control, they believe that spraying does not control the vector and "contaminates". They perceive that the population is not "aware" of Zika prevention and give importance to education within the family and educational centers (Annex 1).

Consequences of Zika in pregnant women

Of the participants, 60.2% (n=435) believe that Zika causes risk of miscarriage, 30.2% (n=218) that it increases the risk of malformation in the newborn, and 19.2% (n=139) believe that they should not get pregnant in order to prevent Zika. Regarding practices, 31.7% (n=229) would choose to use condoms to prevent pregnancy, 62.8% (n=454) of WCA would go to prenatal controls if they were pregnant and with Zika and 98.3% (n=711) believe that they should be tested for Zika during prenatal controls (Table 5). In the focus groups, WCA believe that abortion would not be a choice. WCA perceive the concern and distress that a pregnant woman with Zika could suffer and the importance of psychological care (Annex 1).

Complications of Zika

Regarding complications, 38.7% (n=280) of WCA have heard of microcephaly, of which 87.1% (n=244) related it to zika; 82.1% (n=230) considered when the baby is born

Table 4. Knowledge, attitudes and practices on Zika disease prevention among women of childbearing age, Bagua district, Amazonas department, Peru.

Prevention of Zika	(n = 723)	%
Knowledge		
Can Zika be prevented?		
Yes	681	94.2
No	29	4.0
Does not know	13	1.8
Do you know how Zika can be prevented? *		
Using mosquito nets.	434	60.0
Covering water containers	386	53.4
Disposing of unusable containers (broken buckets, tires).	281	38.9
Keeping the sachet of larvicide in the water container	91	12.6
Allowing fumigation of the house	84	11.6
Avoiding sexual intercourse	26	3.6
Using condoms during sexual intercourse Attitude	14	1.9
Who do you believe has the responsibility to prevent or avoid the spread of the Zika? *		
The family	261	36.1
Health Ministry	197	27.3
Everyone	195	27.0
Personal (individual) responsibility	153	21.2
Regional, Local Government (Municipality)	119	16.5
Practices		
Have you taken any steps to prevent getting sick with Zika? *		
Yes	538	74.4
No	180	24.9
Does not know, does not answer	5	0.7
How have you tried to protect yourself against the Zika virus? *		
Using mosquito nets	411	56.9
Covering water containers	297	41.1
Disposing of containers and broken buckets, tires	158	21.9
Keeping the sachet of larvicide in the water container	101	14.0
Allowing the healthcare agent to enter the house.	57	7.9
Using condoms	32	4.4
Avoiding sexual intercourse	7	1.0
Informing your family about Zika	4	0.6
Have you taken any preventive measures at home to protect your family against Zika? *		
Yes	591	81.8
No	129	17.8
Does not mention	3	0.4
Has the healthcare center taken any preventive measures to protect you against Zika?		
Yes	609	84.2
No	106	14.7
Does not know	8	1.1
What measures has the healthcare center taken to prevent Zika? *		
Placing sachets of larvicide in water containers	489	67.6
Fumigation	369	51.0
Education of the population	229	31.7
Disposal of unusable (broken or unused containers)	278	38.5
Has your municipality taken any steps to protect you and your family against the Zika virus?		
No	645	89.2
Yes	55	7.6
Does not know	23	3.2
What measures has the municipality adopted? *		
Waste collection	28	50.9
Public cleaning and garbage collection	10	18.2
Recycling	4	7.3
Fumigation	3	5.5
Coordination with the healthcare center or network	4	7.3
Does not mention	2	3.6

* multiple choice question total does not add up to 100%.

https://doi.org/10.17843/rpmesp.2021.384.8558

Table 5. Knowledge, attitudes and practices on the consequences of Zika in pregnant women, Bagua district, Amazonas department.

Consequences of Zika in pregnant women	(n = 723)	%
Knowledge		
What consequences could a pregnant woman have if she becomes ill with Zika? *		
Risk of involuntary miscarriage (losing the baby)	435	60.2
The pregnant woman becomes ill	110	15.2
Does not know	109	15.1
Affects the baby	65	9.0
Difficulties in giving birth	38	5.3
The pregnant woman may die	22	3.0
If a pregnant woman becomes ill with Zika, what are the risks to the fetus or baby? *		
The baby is born with a deformity	218	30.2
Baby with small head	199	27.5
Stillborn baby	135	18.7
The baby is born with a physical disability	114	15.8
Does not know	101	14.0
Involuntary miscarriage	76	10.5
The baby gets sick	65	9.0
The baby is born prematurely	53	7.3
The baby has a fever	9	1.2
Death of the mother	6	0.8
Attitude		
To prevent Zika, do you think women should not get pregnant? *		
No	547	75.7
Yes	139	19.2
Does not know	37	5.1
Practices		
If a pregnant woman is sick with Zika, what should she do? *		
Attend prenatal controls as usual.	454	62.8
Take her to a healthcare center.	267	36.9
Stay at home and rest	35	4.8
Keep isolated from others	35	4.8
Stop attending prenatal controls.	35	4.8
Carry out normal activities	7	1.0
Do you think pregnant women should ask to be tested for Zika during their prenatal control?		
Yes	711	98.3
No	7	1.0
Does not know	5	0.7
Since you first heard about Zika disease, have you taken any steps to prevent pregnancy?		
Yes	391	54.1
Does not know	315	43.6
No	17	2.4
What action have you taken to prevent pregnancy? *		
Use condoms	229	31.7
Use injectable contraceptives	151	20.9
Use oral contraceptives	105	14.5
Avoid sexual intercourse	57	7.9
Does not know	27	3.7
None	13	1.8

* multiple choice question total does not add up to 100%.

Table 6. Knowledge, attitudes and practices on complications of Zika in women of childbearing age, Bagua district, Amazonas department, Peru.

Complications of Zika in pregnant women	(n = 723)	%
Knowledge		
Have you heard of microcephaly before?		
No	442	61.1
Yes	280	38.7
Does not mention	1	0.1
What do you understand by microcephaly? [a]		
Small baby head	230	82.1
It is a malformation	31	11.1
Does not know	13	4.6
Other	6	2.1
Do you think there is a relationship between Zika and microcephaly? [a]		
Yes	244	87.1
No	17	6.1
Does not know	19	6.8
Have you heard of Guillan Barré syndrome before?		
No	679	93.9
Yes	40	5.5
Does not mention	4	0.6
Do you know what Guillain Barré syndrome causes? [b]		42.5
Unable to walk	17	
Unable to mobilize	14	35.0
Other	6	15.0
Does not know, does not mention	3	7.5
Do you think there is a relationship between Zika disease and Guillain-Barré syndrome? [b]		
Yes	21	52.5
No	9	22.5
Does not know, does not mention	10	25.0
Attitude		
If a woman gives birth to a baby with a physical disability (microcephaly), could she suffer discrimination?		
Yes	543	75.1
No	161	22.3
Does not know	19	2.6
What concerns you most about Zika disease? *		
May cause disability in infants	251	34.7
May cause death	242	33.5
May cause disease	198	27.4
Does not know	66	9.1
Practices		
To prevent the birth of children with Zika complications, what should be done? *		
Self-care (use of contraceptive methods)	424	58.7
Postponing pregnancy	100	13.9
Nothing can be done	109	15.1
Other	88	12.2
If you had a child with a physical disability, where would you go for growth and development care? *		
Healthcare center	684	94.6
Private physician	31	4.3
Specialist physician	19	2.6
Therapy and rehabilitation	14	1.9
Does not know	7	1.0
Other	8	1.1

* multiple choice question, total does not add up to 100%; a Total number is the number of WCA who answered yes to the question: Have you heard of microcephaly before,? b Total number are the WCA who answered yes to the question: Have you heard of Guillan Barré syndrome before?

https://doi.org/10.17843/rpmesp.2021.384.8558

with a small head to be a complication of Zika. On the other hand, 5.5% (n=44) had heard about Guillain Barré, of which 52.5% (n=21) related it to Zika and 42.5% (n=17) considered that it causes difficulty in moving. Of the WCA, 34.7% (n=251) were concerned that Zika could cause disability to their babies; 75.1% (n=543) believed that the mother of a baby with a disability could suffer discrimination. Regarding practices, 58.7% (n=424) would use contraceptive methods to prevent complications; 2.6% (n=19) would take a child with a disability to a specialist or rehabilitation 1.9% (n=14) (Table 6). In the focus groups, WCA perceived that children with Zika are not necessarily born with malformations (Annex 1).

DISCUSSION

The participants did not identify sexual and vertical transmission of Zika as forms of transmission, a situation similar to the study by Nelson E. *et al*, in which only 2% of women identified sexual intercourse as a route of transmission [16]. On the other hand, exanthema was one of the clinical manifestations least recognized as characteristic of the disease; similar findings were also described in the dengue and Zika endemic areas of the Dominican Republic, where only 8% of the population recognized this manifestation as the main sign of Zika [16], despite being a frequent characteristic of the disease [17].

In addition, the most frequently recognized symptoms of Zika were fever, headache, and malaise, characteristic manifestations of dengue, which would reflect not only lack of knowledge, but also confusion between the two arboviruses. These findings have also been described in Iquitos [18] and could be related to the greater public health impact (fatal cases) and greater media coverage given to dengue. The influence of media coverage, in addition to risk communication by official media, on the knowledge, practices and familiarity of the population with the disease has been described [19], which is key to improving adherence to preventive measures.

Radio, talks by health personnel, and television were the mostly reported sources of information about the disease, reflecting mass dissemination efforts during the Zika outbreak in Bagua [20]. However, in the focus groups, the perception was that information via radio and television is brief and they suggest that health personnel should conduct more educational talks. Delet J. *et al*., in a study conducted in Martinique, reported that 64.3% of pregnant women suggested dissemination strategies other than radio and television [21]. In addition, the focus groups participants considered it necessary to have access to more information on prevention, treatment and less repetitive messages; therefore, not only the media should consider the interests of the population [22], but also the quantity and quality of the information.

The low percentage of condom use or sexual abstinence to prevent Zika is compatible with similar findings in other countries in the region. D'Angelo DV. *et al*. found, in Puerto Rico, that these preventive measures were not common practice among pregnant women [23]. Although no details of perceptions of these preventive measures were collected in the focus groups, the study by Weldon C. describes cultural barriers [18] and may be related to reluctance by the partner or low frequency of use in the context of a conjugal relationship.

Similar results have been described in other regions of Peru; for example, Palma H. *et al*. found, in Piura, that the population justified their reluctance to vector control because they did not perceive the desired effect [24]. Although the focus group participants recognized the work of the health sector, they reported that the lack of coordination between the local government and the health sector is an important limitation. The study by Weldon C., *et al.* suggested complementing vector control with short informative talks on prevention [18], which, together with the participation of community agents and local government, could represent an alternative to optimize interventions. Pérez-Guerra C. *et al.* found that the population considers that local governments should participate actively and sustainably [25].

Regarding education within the family, educational centers were also considered important spaces for the transmission of preventive messages. Guber DJ. *et al.* considered that health behavior modifications in the community can take years, so it is important to initiate programs based on the family and community [26]. Previous evidence reports that the insertion of health programs in schools significantly increases the knowledge of students [27], who, in turn, deliver information to their homes [25].

The majority of the WCA considered that Zika can cause miscarriage, a finding similar to that reported by Burgos S., *et al.* in Lambayeque-Peru, where 50% of participants recognized the risk of miscarriage during pregnancy [28]; they also considered that pregnant women at risk should attend scheduled prenatal controls, as well as being tested for Zika. Pooransingh S. *et al.* in Trinidad and Tobago found that 88% of pregnant women considered that they should be tested for Zika and 76.9% considered that pregnant women with Zika should see a doctor [29].

Qualitative results suggest that participants do not consider abortion as a preventive measure. Pooransingh S.

et al. reported that 62% of pregnant women did not agree that women with Zika should have abortions [29]. However, they perceived that the distress suffered by pregnant women with Zika, or by mothers of children with sequelae, requires psychological care. The WHO mentions that pregnant women with Zika are highly likely to develop symptoms of distress [30]; therefore, it is important to guarantee their specialized care.

The proportion of WCA who have heard about microcephaly, Guillain-Barré syndrome and its relationship to Zika is low. Similar findings were observed in the study by Pooransingh S. *et al.* who found that 37.4% of pregnant women considered that there was a link between Zika and Guillain Barré syndrome [29]; Nelson E. *et al.* found that 10.4% of the population of women considered microcephaly as a risk for their babies [16].

Our study had limitations that may affect the conclusions, the first being that the answers may have been affected by recall bias and social desirability bias. However, the integration of quantitative and qualitative findings allowed us to go deeper into some aspects that would not have been possible to clarify with either of the two individual approaches. In addition, the study used the WHO survey as a basis and was validated by expert judgment and pilot testing in a similar jurisdiction, which improved the understanding of the questions in the questionnaire. On the other hand, the focus groups did not include pregnant women; the participants were the WCA who had the time and perhaps greater concern about the subject. Likewise, the study was conducted in urban and peri-urban areas of the city of Bagua, so WCA from native communities were not included. However, the invitation was extended to all sectors and those responsible for the fieldwork sought to include participants from most sectors.

In conclusion, the results show gaps in knowledge and prevention practices for sexually transmitted Zika. There are important perception barriers about vector control activities, lack of coordination between local government and health services, and there is a need for more and better information about Zika. The role of the family and educational centers is considered very important and underutilized, as well as the need to optimize prenatal control, screening and psychological support for pregnant women with Zika and mothers of children with sequelae. It is recommended that authorities responsible for prevention and control interventions, at all levels of government, should contextualize intervention strategies according to local conditions. This type of research is very useful to support the evaluation of interventions before, during and after an outbreak.

Acknowledgments: Yliana Margot Rojas Medina, psychologist at the National Center for Epidemiology, Disease Prevention and Control, for her support at the beginning of the study.

Authorship contributions: Conceptualization of the project: SML, JGC, EPS. Study design: EPS, JCR, SML. Data analysis and interpretation: SML, JCR. Article writing: SML, EPS. Observation review: SML. All authors participated in the literature search, collection of results, critical revision and approval of the final version.

Funding: This article was carried out as part of the activities of the technical unit for epidemiological surveillance of Metaxenic and other vector-borne diseases of the National Center for Epidemiology, Prevention and Disease Control of the Ministry of Health, Lima, Peru.

Conflicts of interest: The authors declare that they have no conflicts of interest.

Disclaimer: The views expressed in this publication do not necessarily reflect the views of the Centro Nacional de Epidemiología, Prevención y Control de Enfermedades.

Supplementary material: Available in the electronic version of the RPMESP.

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