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The contribution of herbal medicine in health problems of the indigenous community of Oaxaca, Mexico

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ABSTRACT
Objective: To characterize the ways and magnitude in which herbal medicine mitigates health problems and represents a source of savings; as well as to identify the most common ailments treated with herbal medicine and the most used medicinal plants in Santiago Ixtaltepec, Nochixtlán, Oaxaca.
Design/methodology/approach: The study was conducted in 2022, with a quantitative approach and a descriptive-correlational scope. Data were obtained through a survey, applied through direct interviews. Once the data were obtained in the field, they were systematized and processed in Excel databases and descriptive statistical analysis was performed to determine frequencies, percentages, means and other measures of dispersion.
Results: The use of herbal medicine is relevant as an alternative in health care for the community's population. The most common ailments treated with herbal medicine are stomach aches, postpartum treatment, cough, fever, and bad breath, and the most commonly used medicinal plants are coyote grass, horehound (*Marrubium vulgare*), cancer grass, puli (*Pinaropappus roseus*), and juniper (*Juniperus deepeana*).
Limitations on study/implications: As this is a case study, the findings are not generalizable but specific to the community of study.
Findings/conclusions: Herbal medicine contributes to the mitigation of health problems and its use has an impact on the economy of families. There is a direct relationship between the most common symptoms and the most used plants in the community.

Keywords: Herbal medicine, health, Mixtec community, common ailments.

INTRODUCTION
Indigenous peoples are subjected to important economic, social, cultural and political inequalities that keep them in conditions of poverty and exclusion. In 2018, 15.4% of the indigenous population lacked access to health services and 78.2% did not have social security; 31.1% presented educational backwardness; 28.5% lacked quality in housing services; 57.5% of the indigenous population presented lack of access to basic housing services; and 31.5% presented lack of access to food (CONEVAL, 2019).

In Mexico, indigenous communities live under a system historically dominated by racism, which has been defining in the living conditions and access to services of their population, constantly victims of structural violence, understood as differentiation made from social stratification and because of which the most vulnerable sectors are violated in their access to basic rights, such as health care. Institutional racism has ideologically justified the inequitable access of indigenous peoples to the satisfaction of their rights, which is visible because: a) there is no program or specific resources for the attention to cultural differences of indigenous communities, such as the existence of translators, linguistic or cultural interpreters; b) there is difficulty in access to the health care system, hospitals are concentrated in cities, leaving aside rural and indigenous populations, and c) there is discrimination from health staff and users toward the ethnic condition based on stereotypes (Cortez *et al.*, 2020).

The social determinants of these inequalities are linked at three levels: structural, institutional, and of livelihoods; that is, the limited access to basic satisfiers such as food, work and housing (drinking water reduces gastrointestinal diseases and the construction materials are determinant for the prevention of respiratory illnesses); the limited access to health care benefits due to geographic conditions, and the limited access to education. Knowledge about health allows better decision making, in addition to speaking Spanish, which is fundamental for the access to services (Freyermuth, 2017).

Presently, herbal medicine is a cultural element to which indigenous peoples have access; it represents an alternative to face health problems and the current context of institutions (Cortez *et al.*, 2020). It is a component of traditional medicine and can be defined as the practice and knowledge of the use of herbal medicines, which due to their value are used by the community for the attention, prevention, promotion, and/or treatment of health problems (Lima *et al.*, 2019).

It is calculated that about 10 thousand species in the world are used in a medicinal or therapeutic way, and around 80% of the population in developing countries depends nearly completely on the use of plants as home therapy to cover basic health needs (Prieto *et al.*, 2004). Their broad use is attributable to their easy access, affordability and efficiency to treat chronic ailments, diseases that are not serious, and minor or moderate symptoms.

Mexico stands out for its great floristic diversity, its contribution to herbal medicine is calculated conservatively in more than 5,000 species, which corresponds to 15% of the total vegetation in the country (Bellucci, 2001) and Oaxaca is one of the states with greatest biodiversity and pluriculturalism of the country; the Sierra Mixteca and its vegetation are among the most studied, yet there is scarce information regarding its ethnobotany and the medicinal use of its herbs, although they represent an important component for health care and the treatment of ailments among its inhabitants (Bellucci, 2001).

In terms of health, the Mixtec peoples have a strong connection to their traditions and culture, so the causes of their physical or emotional illnesses are related to the fluctuation of the cold-heat relation of the body, from dietary disorders, sudden movements, alterations in the vital force, and in general from the imbalance suffered in the body because of

natural phenomena (empacho) or socially caused (fright, evil eye). These communities "have a tradition of health attention through medicinal plants, cures, massages, cleanses and *temazcal* baths" (París-Pombo, 2008, p. 65).

According to the study by Valdés (2013) carried out in several communities of the zone, among them Santiago Ixtaltepec, it was identified that among the diseases of greatest importance in the region there are the respiratory, caused by changes in temperature; the gastrointestinal, derived from insalubrity; malnutrition in children; and those caused by excess work. The use of medicinal plants is common to "cure discomfort and ailments such as colds, coughs, diarrhea, stomach pain, fever and body ache", and most of the plants that are conserved and used are native (Valdés, 2013, p. 94).

Thus, this study has the hypothesis that traditional herbal medicine represents an important component in the health care of the Mixtec community of Santiago Ixtaltepec; it is a therapeutic option and an alternative for disease prevention, which complements the lack of access and deficiencies in conventional health care systems. Therefore, its objective was to characterize the ways and magnitude in which herbal medicine mitigates health problems and represents a source of savings; to identify the most common ailments treated with herbal medicine and the most frequently used medicinal plants in Santiago Ixtaltepec, Nochixtlán, Oaxaca.

MATERIALS AND METHODS

Located in the Mixtec region, the municipality of Asunción Nochixtlán is located in northeastern Oaxaca; the climate is mainly semi-dry temperate (52.74%) and temperate sub-humid with summer rains (21.37%), with a temperature that ranges between 16 and 22 °C, and a rainfall range of 400 to 1,000 mm (INEGI, 2006). The predominant vegetation is oak (*Quercus* spp.), ocote pine (*Pinus* spp.) and juniper (*Juniperus* spp.) forest (Alvarado and Martínez, 2017).

The locality of Santiago Ixtaltepec is 15.1 Km southeast from the municipal township (Figure 1); its geographic location is at longitude 97° 06' 51.0", latitude 17° 32' 36.0" and altitude of 2,264 meters above sea level. It has a population of 116 inhabitants (31 of age zero to 14 years; 63 from 15 to 64 years; 22 older than 64 years), according to the INEGI 2020 census.

The methodological approach of the study was quantitative with a descriptive-correlational reach (Hernández-Sampieri *et al.*, 2014), and the contribution of herbal medicine to the wellbeing of inhabitants of the community of Santiago Ixtaltepec was characterized in terms of health and the savings that it can represent for the economy of families; the most common diseases and the most frequently used medicinal plants in the community were identified through the application of a survey, with a questionnaire made up of 21 items, divided into three sections: 1) the socioeconomic aspects of the participant and his/her family; 2) the impact of herbal medicine on the health and economy of families; and 3) the herbal medicine practice.

For the application of the questionnaires in the field, a probabilistic sample was obtained previously through the formula:

$$n = \frac{\dfrac{z^2 x p (1-p)}{e^2}}{1 + \left(\dfrac{z^2 x p (1-p)}{e^2 N} \right)}$$

where $N=$Total population, $z=$Level of confidence (1.96), $p=$Proportion expected (0.95), and $e=$Margin of error (0.05) considering that in Santiago Ixtaltepec there is a universe of 58 families, and according to the resulting sample 32 questionnaires were applied to men and women heads of household, distributed in the different places of the whole community. Its application was through direct interviews in the month of September, 2022.

Once the data were obtained in the field, they were systematized and processed in Excel databases with which the basic statistical analysis for the determination of frequencies, percentages, means and other dispersion measurements was conducted.

RESULTS AND DISCUSSION
Sociodemographic profile of the population of study

In the survey applied to 32 heads of family, 75% were women and 25% men; the age range in the case of men ranges between 48 and 81 years with an average of 64 years, while for women the average age was 63 years, the minimum 38 and the maximum 91.
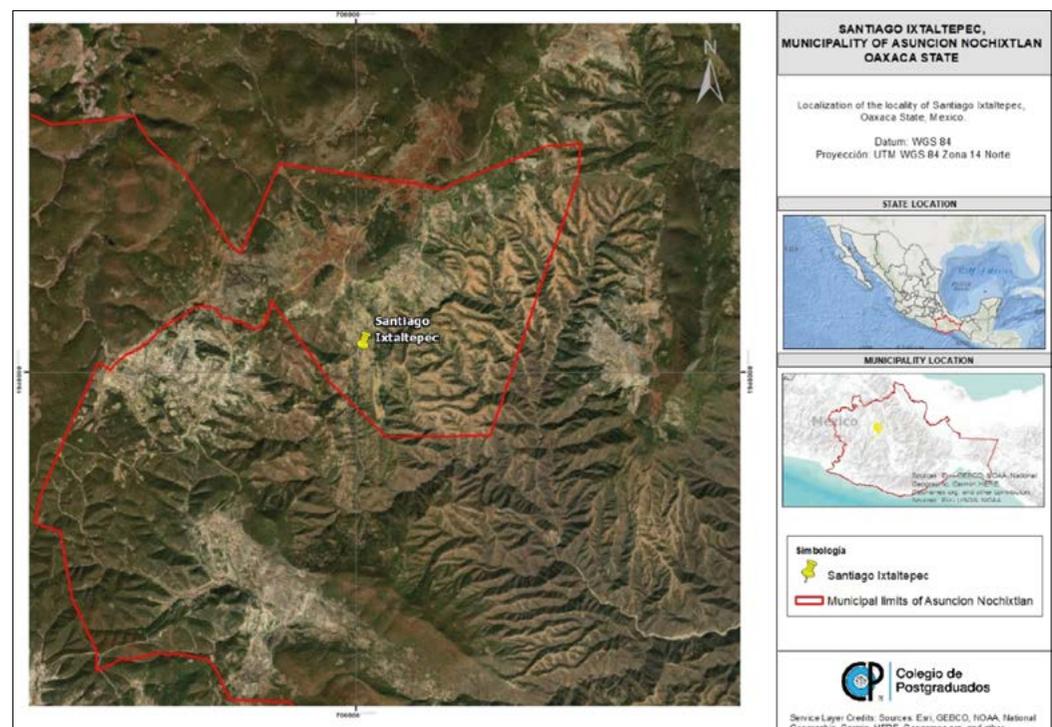
Figure 1. Location of Santiago Ixtaltepec, Nochixtlán, Oaxaca, Mexico.
Source: Prepared by the authors.

Regarding the level of literacy, 100% of the men interviewed know how to read and write, they have an average schooling of 5.5 years, while in the case of women, 21% do not know how to read or write, and the 79% that do have average schooling of 6.4 years. All (100%) of the men surveyed speak Mixtec, while among women it is 92%; one survey respondent (4%) understands it but does not speak it and only one (4%) does not understand or speak it.

Regarding the occupation of participants, among men, 100% are devoted to farming activities, production of corn, bean, vegetables, sheep breeding and other livestock, basis of the diet. Of all the women, 71% are devoted to the home, 21% to farming, 4% are paid workers, and the remaining 4% traders. Of the women, 50% mention having a secondary activity related to the farmland.

The incomes in households are limited, the main activity carried out is farming, and this is basically to satisfy the need for sustenance of the family, occasionally complemented with activities that some members of the family perform outside the community whether temporally or permanently, and with government supports; therefore, as Banerjee and Duflo (2012) mention, among families that live under conditions of poverty, the presence of a serious disease can become the event that ruins them or leads to the loss of the scarce stability they have, since the diseases that require specialized medical attention or displacement of the ill person imply an important expenditure that could gravely impact the welfare of the family, even more if the ill person is the main provider for the household.

The impact of herbal medicine on health

The most common ailments in Santiago Ixtaltepec, according to 72% of the participants, are colds caused by changes in temperature; cough and body aches occupy 9% and 6%, respectively, which agrees with what was exposed by Valdés (2013). Of the participants, 75% reported that they prefer to use herbal medicine first to treat their ailments, and resort to the doctor only if it does not work, or if the disease is more serious, of greater urgency or requires specialized attention. The remaining 25% of the participants resort immediately to medical attention and the use of allopathic medications.

In the last year (August 2021 to July 2022), 91% of the interview respondents or a member of their family suffered an ailment; 45% of these correspond to non-serious diseases such as colds (42%) and tonsillitis (3%), 31% to chronic illnesses such as constant pains in a body zone (22%), diabetes (3%), anemia (3%), and liquid retention (3%), and 24% to serious diseases such as fractures (7%), one eye surgery (7%), one vesicle surgery (7%), COVID (3%) and pneumonia (3%).

Of all the interview respondents with an ailment in the last year, 28% were treated only with herbal medicine (21% for non-serious diseases and 7% for chronic illnesses), 14% complemented medicinal plants with medications (all with chronic illnesses). Of the respondents, 58% had access to allopathic medicine immediately after presenting symptoms (24% linked with serious illnesses, 10% with chronic, 24% for non-serious diseases).

Of the total families that had some ailments during the last year, 72% resorted to the use of medications whether immediately or in combination with the medicinal plants, and this could be because of its unavoidable need to use them in the case of serious illnesses, because the medications are easy to use and they tend to combat the symptoms in shorter time, and due to their easy access since they are supplied in the clinic and often they have them at home leftover from other times.

Herbal medicine is a valuable resource that is part of the attention and care that is provided within the household when an illness presents, it represents an alternative to combat common symptoms, of immediate acquisition and without cost (many plants are found in the backyards, others have to be collected again, and some species will be available after being collected during a specific season of the year and conserved for their later use), which is why the use of medicinal plants can avoid the difficulty involved when the person who presents the common symptoms has to travel from their household to the clinic in the center of the community, to Nochixtlán or Oaxaca.

Site and cost of medical attention

From the medical attention received during the period of August 2021 to July 2022, 47% was in the clinic of the community itself to treat chronic diseases (14%) and non-serious illnesses (29%), 24% in Nochixtlán to treat chronic (14%), serious (5%) and non-serious (5%) diseases, and 29% in Oaxaca where they go to mainly for serious illnesses (28%).

As was established by Cortez *et al.* (2020) and Freyermuth (2017), the accessibility of inhabitants from the community is a determinant factor in health care in the indigenous communities and although Santiago Ixtaltepec has its own Rural Medical Unit from where they obtain medical assistance and free medications. This clinic does not have the necessary staff; for example, since the month of February 2022 until the date of the study (September, 2022), when the resident doctor concluded his service, only a nurse has been present, who is available only from Monday to Friday, which is why to treat serious illnesses or during the weekend, it is necessary to go to Nochixtlán, where they can gain access to medical attention but the community is located more than 15 km away from the municipal township and there is no public transport that connects them. This is an important factor that affects the access and the economy of families when dealing with health issues, since in addition to the doctor's fees and the cost of medications, the inhabitants of Santiago Ixtaltepec can pay between $150 and $300 for transport only to leave the community in a situation of emergency, and given the economic limitations of these families this turns out to be a factor of great relevance.

Regarding the last year, the families that presented some serious illness had an average expenditure of $17,685.00, a minimum of $2,800.00 and a maximum of $40,000.00; in chronic diseases, the average investment was $1,333.00, with minimum of $0.00 and maximum of $6,000.00; meanwhile, for non-serious illnesses, most of the families didn't have to pay, so the average expense for their attention is $161.00, the minimum is $0.00 and the maximum $800.00.

In the case of the families that required being treated in Nochixtlán, the average cost was $2,520.00, with minimum $800.00 and maximum $6,000.00, while those who went to Oaxaca paid a price that ranges from $3,000, from a knee condition, to $40,000 in the case of a vesicle surgery, with an average of $17,714.00.

According to the result from the interviews, 100% of the participants considered that medicinal plants are a good alternative for health care and that their use allows savings in the care of non-serious illnesses, on average $1,212.00 for transport, fees and medications.

Herbal medicine practice

The members of the community have broad knowledge about the plant resources available to them for health care, and the interview respondents mentioned 19 plants on average; it should be mentioned that the plants come to mind according to the need for their use, when a member of the family presents a symptom and the woman or person in charge of caring for the ill does not know what plant to use; they resort to a family member or neighbor to ask which is the adequate plant to treat the illness and the way to use it, so it is possible to state that the knowledge remains latent among members of the community. On the other hand, after specific plants are used to treat specific illnesses, whether of their own or of a member of the family, the user acquires knowledge around this remedy, becoming a specialist in the use of useful plants for that illness.

The 32 people surveyed mentioned 103 different species with medicinal use in total, with the following being the most frequent: *hierba de coyote* (*Calea ternifolia*), horehound (*Marrubium vulgare*), *hierba de cáncer* (*Tournefortia mutabilis*), *puli* or *espule* (*Pinaropappus roseus*), juniper (*Juniperus deepeana*), *chamizo* (*Barkleyanthus salicifolius*), arnica (*Heterotheca inuloides* Cass.), wormwood (*Artemisia absinthium* L.), rue (*Ruta graveolens* L.) and aloe (*Aloe vera* L.) (Table 1).

Based on the survey conducted in the community of Santiago Ixtaltepec, it was found that the most common ailments treated with various medicinal plants are: stomach pain, post-partum treatment, cough, fever, mal de aire (bad breath), cold, diarrhea, bile, wounds, kidney discomfort, and evil eye (Table 2).

For stomach pain, 24 different plants were mentioned, with the most popular being hierba de coyote and wormwood or hierba maestra (*Artemisia absinthium* L.).

In the community, applying herbal baths is still very common after the woman has given birth, the most common plants in this treatment are: reed (*Phragmites australis*), *cachovenado* (*Dodonadea viscosa*), juniper (*Juniperus deepeana*), *vergonzosa* (*Mimosa albida*), *chamizo* (*Barkleyanthus salicifolius*), *hierba de cáncer* (*Tournefortia mutabilis*) and arnica (*Heterotheca inuloides* Cass.). The medicinal plants used for this treatment help in closing wounds, for tissues to contract, to expel the cold from inside the body, and to prevent infections.

For the treatment of cough, 18 plants were mentioned, the most relevant due to the frequency of mentions are: eucalyptus (*Eucalyptus globulus* Labill), bouganvillea (*Bougainvillea glabra*), lime (*Citrus aurantifolia*), mullein (*Verbascum thapsus*), and tandede (*Gymnosperma glutinosum*), and it is common for these plants to be consumed in a mixture of two or more, a compound tea.

Table 1. Most mentioned plants.

Common Name	Scientific Name	Frequency	%
Coyote grass	*Calea ternifolia* Kunth	39	6.44%
Horehound	*Marrubium vulgare* L.	29	4.79%
Cancer herb	*Tournefortia mutabilis* Vent.	29	4.79%
Puli	*Pinaropappus roseus* (Less.) Less.	28	4.62%
Juniper	*Juniperus deepeana* Steud.	27	4.46%
Chamizo	*Barkleyanthus salicifolius* (Kunth) H. Rob. & Brettell	26	4.29%
Arnica	*Heterotheca inuloides* Cass.	23	3.80%
Wormwood	*Artemisia absinthium* L.	20	3.30%
Rue	*Ruta graveolens* L.	19	3.14%
Aloe	*Aloe vera* L.	18	2.97%
Cachovenado	*Dodonadea viscosa* (L.) Jacq.	17	2.81%
Tandede	*Gymnosperma glutinosum* (Spreng.) Less.	15	2.48%
White sapote	*Casimiroa edulis* La Llave	15	2.48%
Smells at night	*Cestrum nocturnum* L.	12	1.98%
Ink	*Justicia spicigera* Schltdl.	12	1.98%
Rosemary	*Rosmarinus officinalis* L.	11	1.82%
Maguey papalome	*Agave nuusaviorum* García-Mend.	10	1.65%
Angel grass	*Ageratina tomentella* (Schard.) R. M. King & H. Rob.	9	1.49%
Eucalyptus	*Eucalyptus globulus* Labill.	9	1.49%
Garlic	*Allium sativum* L.	8	1.32%

Source: Self elaborated with field data.

Table 2. Most common diseases.

Disease	Frecuency	%
Stomachache	73	11.99%
Postpartum Treatment	45	7.39%
Cough	45	7.39%
Fever	40	6.57%
Bad breath	39	6.40%
Flu	31	5.09%
Diarrhea	29	4.76%
Bile / Cholera	28	4.60%
Wounds	27	4.43%
Kidney discomfort	22	3.61%
Evil eye	20	3.28%
Infections	18	2.96%
Stroke / Hematoma	17	2.79%
Diabetes	15	2.46%
Scare	11	1.81%
Gastritis	8	1.31%
Inflammation	7	1.15%
Hypertension	7	1.15%
Muscle Pain	6	0.99%

Source: Self elaborated with field data.

CONCLUSIONS

The conclusion is that herbal medicine contributes to the mitigation of health problems and is a source of savings, since it represents an important alternative for health care, for the prevention and treatment of diseases. The most common ailments identified treated with herbal medicine are stomach pain, post-partum treatment, cough, fever, bad breath, cold, diarrhea, bile, wounds, kidney discomfort, and evil eye; the most used medicinal plants in the community Santiago Ixtaltepec are *hierba de coyote* (*Calea ternifolia*), horehound (*Marrubium vulgare*), *Hierba de cáncer* (*Tournefortia mutabilis*), *puli* or *espule* (*Pinaropappus roseus*), juniper (*Juniperus deepeana*), *chamizo* (*Barkleyanthus salicifolius*), arnica (*Heterotheca inuloides* Cass.), wormwood (*Artemisia absinthium* L.), rue (*Ruta graveolens* L), and aloe (*Aloe vera* L.).

A growing use of allopathic medications is seen among inhabitants of the community of Santiago Ixtaltepec, access to them without cost, the need, the practicality, and the ease in use are some of the factors that influence the preference of inhabitants for their use; this situation reflects the advantage of the presence of the health system within the community, and although there are deficiencies, such as there not being a permanent doctor or women having to be transported to distant shelters to give birth, the attention that the clinic offers is valuable and necessary, and a right of this and any other community in the country.

The family medical unit, the presence of doctors and nurses, and the use of allopathic medications do not reduce the importance of herbal medicine for the attention of various symptoms and ailments so the members of the community are commonly affected. Their use and that of traditional medicine has an impact on the economy of the families in Santiago Nochixtlán, and this is not necessarily linked with preventing the use of allopathic medications, since these, are regularly received free of charge, as has been mentioned. The attention to symptoms and common illnesses with medicinal plants implies significant savings when avoiding the need to exit the community to receive medical attention, since the costs related to this need are mainly connected with mobility, situation given directly by the geographic location of the community and the lack of public transport, so health recovery through the use of herbal medicine implies considerable savings in this sector for the families.

REFERENCES

Alvarado, M., y Martínez, M. (2017). Diagnóstico ambiental. Caso de estudio: Municipio Asunción Nochixtlán, Oaxaca, México. En M. del Roble Pensado Leglise y L. A. García Serrano (Eds.), Los retos actuales de las Ciencias Ambientales y de la Sustentabilidad en México (pp. 222–240). https://ipn.elsevierpure. com/ws/portalfiles/portal/26827788/2017_CAP_TULO_DE_LIBRO_Diagn_stico_Ambiental_ Caso_de_estudio_Municipio_Asunci_n_Nochixtl_n_Oaxaca_M_xico.pdf

Banerjee, A. V., y Duflo, E. (2012). Repensar la pobreza. Un giro radical en la lucha contra la desigualdad global. (4a ed.). Taurus.

Bellucci S, A. P. (2001). La herbolaria en los mercados tradicionales. *Revista del Centro Investigación, 5*(18), 63–70. https://www.redalyc.org/pdf/342/34251806.pdf

CONEVAL. (2019). La pobreza en la población indígena de México, 2008-2018. https://www.coneval.org. mx/Medicion/MP/Documents/Pobreza_Poblacion_indigena_2008-2018.pdf#search=concentracion de población indígena

Cortez-Gómez, R., Muñoz-Martínez, R., y Ponce-Jiménez, P. (2020). Vulnerabilidad estructural de los pueblos indígenas ante el COVID-19. *Boletín sobre COVID-19, 1*(7–8), 7. https://dsp.facmed.unam. mx/wp-content/uploads/2022/03/COVID-19-No.7-8-04-Vulnerabilidad-estructural-de-los-pueblos-indigenas.pdf

Freyermuth, G. (2017). Mortalidad en población indígena desde los determinantes sociales y violencia estructural. En M. G. Freyermuth Enciso (Ed.), El derecho a la protección de la salud en las mujeres indígenas en México. Análisis nacional y de casos desde una perspectiva de Derechos Humanos (pp. 23-48). Comisión Nacional de Derechos Humanos, CIESAS.

Hernández, R., Fernández, C., y Baptista P. (2014). Metodología del Trabajo Intelectual (Sexta Ed). Mc. Graw Hill.

INEGI. (2006). Prontuario de información geográfica municipal de los Estados Unidos Mexicanos Asunción Nochixtlán, Oaxaca. 9. http://mapserver.inegi.org.mx/mgn2k/;

INEGI. (2020). Asunción Nochixtlán, Oaxaca. México en cifras. https://www.inegi.org.mx/app/areasgeograficas/?ag=20

Lima, Y., Guzmán, V., López, Y., y Satchwell, R. (2019). La medicina tradicional herbolaria en los sistemas de salud convencionales. *Humanidades Médicas, 19*(1), 201–217. https://www.medigraphic.com/pdfs/hummed/hm-2019/hm191m.pdf

París-Pombo, M. D. (2008). Promoción De La Salud Y Poder De Género En La Mixteca Oaxaqueña. *Agricultura, Sociedad y Desarrollo, 5*(1), 53–69. http://www.scielo.org.mx/pdf/asd/v5n1/v5n1a4.pdf

Prieto-González, S., Garrido-Garrido, G., Gonzalez-Lavaut, J. A., y Molina-Torres, J. (2004). Actualidad de la Medicina Tradicional Herbolaria. *CENIC Ciencias Biológicas., 35*(1), 19–36. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1028-47962006000200001

Valdés, A. (2013). Conservación y uso de plantas medicinales: el caso de la región de la Mixteca Alta Oaxaqueña, México. *Ambiente y Desarrollo, XVII*(33), 87–97. https://repository.javeriana.edu.co/handle/10554/22814