

## Risk Factors and Clinical Manifestaciones Associated with Gallbladder Lithiasis in a High Andean population of Cajamarca, Peru, 2024

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### ABSTRACT

This study sought to determine risk factors and clinical manifestations of gallstones (VL) in the high Andean population of Chetilla; there are no similar studies in the Region. A case-control study was conducted during 6 itinerant medical care sessions in 2024. A medical consultation and ultrasound examination were performed each time. The sample consisted of 300 patients aged 20 years and older; the instrument was a previously validated data collection form. Patients with ultrasound findings of VL were considered cases, and those without VL were considered controls. The OR was applied to potential risk factors, which determines the strength of association, and the p-value indicates statistical significance. 78% were women and 22% were men. The variables studied were: gallstones, age, sex, education, occupation, diet, use of hormonal contraceptives, BMI, diabetes mellitus, multiparity, language, and digestive discomfort. Multivariate analysis and logistic regression revealed: Risk factors for cholelithiasis include overweight, obesity, and a high-fat diet; a diet rich in vegetables is a protective factor. The overall prevalence was 15%, 17.09% in women, and 7.57% in men. Risk factors include overweight, obesity, and fat intake; protective factors include vegetable intake and, apparently, the intense physical activity of Andean men. Although the majority of VL cases are asymptomatic (63.66%), it is a priority to prevent and treat its complications promptly.

**Keywords:** Gallbladder Lithiasis, Risk Factors, High Andean Population

### INTRODUCTION

Cholelithiasis or gallstones (VL), defined as the presence of stones or stones in the gallbladder, is one of the most prevalent digestive diseases in Western countries, where about 80% of VL are asymptomatic, in 20% there are discomforts such as abdominal colic and in about 5% there are complications that demand a greater number of hospitalizations. In addition to outpatient procedures, radiological studies, plus endoscopic or surgical procedures, with great cost for patients and health systems, in addition to social implications (1,2)

In Western countries, cholelithiasis affects 10-15% of the adult population with a progressive increase in its prevalence due to increased life expectancy, obesity and metabolic syndrome. However, the prevalence is highly variable depending on the population; in the United States it affects 10-15%, in Europe, close to 20%, in Latin America, 5-15%, and less than 5% in sub-Saharan African blacks (3,4).

In the Americas, cholelithiasis is more prevalent in the indigenous population; in Native Americans it affects 60-70% and between 30-50% in South American Native Americans (3,4). In Chile, it is higher in the Mapuche indigenous population (49.4% in women and 12.6% in men) and Aymara (42%), compared to those living (mestizo population) in Santiago de Chile (27%) and Maori from Polynesia (21%) (4,5,6); in Argentina 21.6% (7), in Mexico (14.3%): higher in women (20.5%) than in men (8.5%) (8); in Bolivia it was 15.7%-20% (9) and in Ecuador, the prevalence in women of Shuar ethnicity was 44.9%, higher among 35-59 years (46.7%) and in rural areas (59.6%) (10).

Depending on their composition, gallstones can be: cholesterol (up to 95%), black pigments and brown pigments. In the pathogenesis of cholesterol stones, three phases are identified: 1. The bile supersaturation phase 2. The nucleation phase of cholesterol in the bile and 3. The hypomotility phase of the gallbladder, when the gallbladder no longer contracts enough to regularly empty its contents (11, 12)

The etiology of cholelithiasis is complex, multifactorial and not well known, where genetic and environmental factors (geographical, ethnic, racial, dietary, medicinal, cultural and racial, etc.) interact with similar relevance. Among the risk factors reported: modifiable, non-genetic, obesity, diet, physical activity, rapid weight loss (>1.5 kg/week), number of pregnancies, drugs such as oral contraceptives (ACOS), among others; non-modifiable factors are genetics and ethnicity (Pima Indians in North America, indigenous people of the South American highlands in Chile, Bolivia, Ecuador, Argentina and Peru), gender, and advanced age, on which we cannot intervene (12,13,14).

In Peru, Moro (15), in a study of the high-rise rural population, found a prevalence between 4 and 10% in men and 18 to 20% in women, higher in women, with older age and body mass index. In another study in the peri-urban population of Lima, the prevalence was 16.1% in women and 10.7% in men, more associated with the female sex, multiparity, and the use of oral contraceptives (16).

About 80% of people with cholelithiasis are asymptomatic, 2-4% have symptoms at one year, up to 10% at 5 years and 0.7 to 3% will develop serious complications such as: acute cholecystitis, gallbladder gangrene, peritonitis, acute pancreatitis, cholangitis, choledocholithiasis, gallbladder cancer when there are large gallstones (>3 cm) or gallbladders full of stones (17,18).

Cholelithiasis is one of the top five causes of surgical intervention in the world and its diagnosis is based on clinical, laboratory and ultrasound data that detects gallbladder stones in about 100% of cases and is neither expensive nor invasive (17,18,19).

In Cajamarca there are no studies on the prevalence of cholelithiasis, it is estimated that it is high, especially in the Andean population in poverty, which generates a great demand for care in health services. In the present study, 300 patients aged 20 years and over are included in 06 itinerant medical care days in four locations in the district of Chetilla held from May to December 2024. Chetilla is one of the poorest and most vulnerable districts in Peru and Cajamarca, with a totally rural population of 3878 inhabitants mostly with Quechua-speaking indigenous ancestry (20,21).

The objective was to determine the risk factors and clinical manifestations associated with Vesicular Lithiasis in the population of the district of Chetilla, Cajamarca-Peru, during the year 2024

## MATERIALS AND METHODS

**Study Design:** The study was prospective, case-control, quantitative

**Study Population:** Population of the district of Chetilla, 4296 inhabitants

**Study Sample:** 300 patients aged 20 years and older.

**Place:** The information was obtained after 06 days of itinerant medical care at: Chetilla Health Post, in the hamlets: Tambo Cochapampa, Tambillo (Primary Educational Institution (IEP) No. 82891 at 3457 m. a.s.l.) and El Manzano (821231 Educational Center at 3082 m. a.s.l.) The activity was carried out in coordination with the Health Post, the Municipality of Chetilla, the Cajamarca Integrated Health Network, as well as the teachers of the educational centers.

**Patient Conditions.** The population was summoned through local media such as radio announcements, banners in strategic places, the workers of the Health Post, teachers and workers of the municipality. The residents, 20 years old and older, are fasting for the ultrasound. In the consultation, the patient went through triage, -all patients were from the Comprehensive Health Insurance (SIS)-, then they went to the internal medicine office where in addition to medical care, the data collection form was filled out; then the patient went to the Radiology office where the specialist doctor performed the ultrasound with a portable ultrasound equipment EDAN model DUS-60 (2013).

**Inclusion Criteria:** All patients of both sexes aged 20 years and older who had a consultation in Internal Medicine were included and then gallbladder ultrasound was performed.

**Exclusion Criteria:** Resident who does not accept the ultrasound, or who has eaten food when coming to the consultation; residents aged 19 years or younger and those from other districts.

**Definition of Variables:** Gallstones (VL): presence of gallstones in the gallbladder. Macrolithiasis: stones greater than 5 mm in diameter. Microlithiasis: stones less than 5 mm in diameter. Single lithiasis: Presence of a stone. Multiple lithiasis: 2 or more stones. Thickened anterior gallbladder wall: greater than 4 mm. Age expressed in years; sex of the patient; weight according to categories: normal, overweight and obesity, configuring the body mass index (BMI). Educational level: no grade (illiterate), primary, secondary or higher; occupation: work or daily activities; Diet: daily food that provides: calories (cereals, legumes, flour), protein (meat, fish, trout), fats: lard or poultry; local vegetables; use of hormonal contraceptives (oral or injectable), diabetes mellitus: if she reports suffering from it or has diabetic relatives, multiparity: woman with 5 or more births, language: Spanish, Quechua or both; and digestive or abdominal discomfort: pain in the right upper quadrant, in the upper hemiabdomen, indigestion (burning, pain, heat, heartburn) after meals, intolerance to fats.

**Data Collection.** The instrument was a survey written in a format, which was validated in a Care Day in March 2024 at the Chetilla Health Post, where it was applied to 12 patients from which it was obtained that the reliability of the instrument, measured by Cronbach's Alpha Coefficient, was high (0.901), of solid internal consistency.

**Data Processing:** A database was developed considering the variables of the research, then the data were processed with the Microsoft Excel program and SPSS 25, elaborating the respective tables.

**Data Analysis.** As it was a case-control study, the cases were patients aged 20 years and older with stones on ultrasound study plus those who underwent cholecystectomy determined by self-information and absence of the gallbladder on ultrasound; Controls were patients aged 20 years and more than the ultrasound study did not find stones in the gallbladder. Of the entire sample, there was a positive group with gallstones, they were the cases and another group that did not present it and they were the controls.

The odds ratio (OR) was applied to the risk factors, which determined the strength of association, then the p value was analyzed, which indicated statistical significance (0.05), in order to be considered as a risk factor. Bivariate statistical analysis (Seek to demonstrate that there is a significant direct or inverse relationship between two random variables) and multivariate (simultaneous study of more than two variables to see how they relate to each other) with multiple regression (to find correlations between data sets) were performed.

The results are presented in tables and graphs of the main characteristics,

Confidentiality criteria of the information were maintained at all times, strictly observing the principle of "first do no harm" (primum non nocere), performing the ultrasound only on those who voluntarily wished to do so.

## RESULTS

Of 300 patients, 234 (78%) were women and 66 (22%) were men. Minimum age 20, maximum age 90 years, average age: 49.68 years. Average age in females: 47.21 years, in males: 52.46 years

**Table 1.** Bivariate analysis of sociodemographic variables in the population aged 20 years and over in the district of Chetilla, Cajamarca-Peru, year 2024.

Risk factors for cholelithiasis	Cases		Controls		OR	CI (95%)	x2	P value	
	No.	%	No.	%					
Age	20-40	15	33.33	90	35.29	0,69	(0,34 - 1,39)	1,06	0,303
	41-60	16	35.55	88	34.50	0,80	(0,40 - 1,61)	0,39	0,534
	61 and over	14	31.11	77	30.19	0,82	(0,40 - 1,66)	0,31	0,580
Age women	20-40	14	35	78	40.20	0,80	(0,39 - 1,62)	0,38	0,539
	41-60	15	37.5	69	35.56	1,08	(0,54 - 2,18)	0,05	0,817
	61 to more	11	27.5	47	24.22	1,19	(0,55 - 2,56)	0,19	0,662
Age in men	20-40	1	20	12	19.67	0,39	(0,05 - 3,08)	0,86	0,354
	41-60	1	20	19	31.14	0,24	(0,03 - 1,82)	2,26	0,133
	61 to more	3	60	30	49.18	0,44	(0,13 - 1,53)	1,74	0,188
Sex	Female	40	88.88	194	76.07	2,52	(0,95 - 6,65)	3,66	0,056
	Male	5	11.11	61	23.92	2,83	(1,08 - 7,45)	4,78	0,029
Occupation	Housewife	39	86.66	184	72.15	2,51	(1,02 - 6,18)	4,22	0,040
	Farmer	5	11.11	53	20.78	0,48	(0,18 - 1,27)	2,29	0,130
	Student	0	--	8	3.13				
	Other	1	2.22	10	3.92				
ACOS*	Yes	14	35	70	36.08	1,19	(0,60 - 2,38)	0,25	0,614
	No	24	65	124	63.91	1,21	(0,64 - 2,28)	0,34	0,561

Breeding	Yes	2	5	2	1.03	5,88	(0,81 - 42,89)	3,90	0,048
	No	38	95	192	98.96	1,78	(0,76 - 4,19)	1,79	0,181
Great multi parity	Yes	13	32.5	78	40.20	0,92	(0,46 - 1,85)	0,05	0,819
	No	27	67.5	116	59.79	1,80	(0,94 - 3,43)	3,23	0,072
Multiparity	2 a +	34	85.00	178	91.75	8,43	(3.38 – 21.02)	26.66	0.001

\*ACOS: Contraceptives

The bivariate analysis of the study variables reveals the following:

- **Age:** No statistically significant association was found between age and the presence of gallstones.
- **Sex:** Female sex was not a clear risk factor ( $p=0.056$ ), although she had an OR of 2.52. On the other hand, male sex could be a protective factor (OR less than 1,  $p=0.029$ ).
- **Educational attainment:** Not identified as a risk factor for cholelithiasis, although the majority of the population has incomplete primary education or illiteracy.
- **Occupation:** Being a housewife was significantly associated with a higher risk of cholelithiasis (OR=2.51,  $p=0.040$ ).
- **Contraceptives, pregnancy and multiparity:** No clear relationship was found between contraceptive use and cholelithiasis.
- Pregnancy could be a risk factor, although the estimate is imprecise due to the wide confidence interval.

**Table 2.** Descriptive and bivariate analysis of anthropometric, nutritional and clinical variables in the population aged 20 years and older in the district of Chetilla, Cajamarca, Peru. Year 2024.

Risk factors for cholelithiasis	Cases		Controls		OR	IC (95%)	X2	P value	
	No.	%	No.	%					
IMC	> a 40	1	2.22	3	1.17	1,91	(0,19 - 18,77)	0,32	0,573
	35 - 39.9	1	2.22	5	1,96	1,14	(0,13 - 9,96)	0,01	0,908
	30 - 34.9	12	26.66	51	20	1,45	(0,70 - 3,01)	1,02	0,311
	25 - 29.9	25	55.55	99	38.82	1,97	(1,04 - 3,73)	4,42	0,036
	18.5-24.9	6	13.33	97	38.03	0,25	(0,10 - 0,62)	10,08	0,002
Diabetes mellitus	Yes	3	6.66	1	0.39	18,14	(1,84 - 178,55)	11,45	0,001
	No	42	93.33	254	99.60	0,06	(0,01 - 0,54)	11,45	0,001
Language	Spanish	22	48.88	151	59.21	0,66	(0,35 - 1,24)	1,67	0,196
	Quechua	0		5	1,96	-----	-----	-----	-----
	Both	23	51.11	99	38.82	1,64	(0,87 - 3,11)	2,39	0,122
Diet	Cereals and vegetables	45	100	255	100	-----	-----	-----	-----
	Animal fat	23	51.11	82	32.15	2,21	(1,16 - 4,18)	6,04	0,014
	Meats	14	31.11	62	25.49	1,40	(0,70 - 2,81)	0,93	0,334
	Vegetables	32	71.11	194	76.07	0,77	(0,38 - 1,57)	0,51	0,476
Digestive symptom	Yes	18	40	91	35.68	1,20	(0,63 - 2,30)	0,31	0,579
	No	27	60	164	64.31	0,83	(0,43 - 1,59)	0,31	0,579

- **Body mass index (BMI):** Overweight was a significant risk factor ( $p=0.036$ ).
- **Diabetes mellitus:** It was identified as an important risk factor ( $p=0.001$ ), with a high OR (18.14).
- **Multiparity:** It was not significantly associated with cholelithiasis (OR=1.80,  $p=0.072$ ). However, having two or more pregnancies did show a statistically significant association with their development (OR=8.43,  $p=0.001$ ).
- **Language:** Most speak Spanish or both languages (Spanish and Quechua). No significant relationship between language and cholelithiasis was identified.
- **Diet:** Everyone consumes cereals and legumes, but only 35% eat animal fat frequently and 26% consume meat occasionally. Fat intake was found to be a significant risk factor for cholelithiasis (OR=2.21,  $p=0.014$ ).
- **Digestive Symptoms:** 36.03% of the population reported digestive discomfort, such as abdominal pain, indigestion and fat intolerance.

**Table 3.** Multivariate analysis and logistic regression in the population aged 20 years and older in the district of Chetilla, Cajamarca-Peru. Year 2024.

Risk factors and clinical manifestations of cholelithiasis	B	Forest	p-value	OR	95% I.C. for OR	
					Inferior	Superior
Overweight	1.40	8.28	0.004	4.0	1.56	10.49

Obesity	1.34	6.44	0.011	3.8	1.36	10.82
Fats	0.94	7.47	0.006	2.6	1.30	5.02
Vegetables	-0.89	3.90	0.048	0.4	0.17	0.99

According to multivariate analysis and logistic regression, the most significant findings were risk factors for cholelithiasis, overweight, obesity, and a high-fat diet. On the other hand, a diet rich in vegetables was a protective factor.

**Table 4.** Ultrasound findings of cholelithiasis in the population aged 20 years and older in the district of Chetilla, Cajamarca-Peru, year 2024.

Ecological findings	N°.	%
1. Single lithiasis (1 litre in BV)	12	26.66
1a. Lito > 2 cms	7	58.33
2. Multiple lithiasis (2 or more) macrolithiasis (litho> to 5 mm)	15	33.33
3. Multiple lithiasis lithiasis: 5mm < litho, biliary sludge	13	28.88
4. Full of lithos,	4	8.88
4a. Full Full, Scleroatrophic	2	50
5. Pared de VB engrosada: > 4 mm	2	4.44
6. Cholecystectomy	4	8.88
Cholelithiasis positive	45	100

15% (7 cases) of all had giant litho; 8.88% (4 cases) had a gallbladder with total stones, of which 50% (2) (4.4% of the total) had a scleroatrophic wall; 4.4% (2) had a thickened wall greater than 4 mm; 2.22% (1) had an ultrasound tumor involving the gallbladder. Thus, 14 (31.11%) presented signs of chronic complications of cholelithiasis, of which 9 (64%) were asymptomatic

The typical ultrasound finding was the presence of highly echogenic echoes within the vesicle that leave a posterior acoustic shadow and with movements move towards the sloping areas.

**Table 5.** Prevalence of cholelithiasis in the population aged 20 years and over in the district of Chetilla, Cajamarca-Peru, 2024

Prevalence of Cholelithiasis (CP)	N°	%
PC general	45	15
CP in women (out of 234)	40	17.09
Male CP (66 out)	5	7.57

## DISCUSSION

The study collects clinical-ultrasound findings obtained in six days of care in Chetilla, a rural district of Cajamarca, Peru, with a population of 3878 inhabitants, 53% women and 47% men, 100% rural, with 32.6% of households of "high economic dependence", traditionally speaking Quechua, although with increasing use of Spanish, which faces high poverty rates (22,23).

The analysis at the district level shows that Cortegana, Chetilla and Tumbaden are ranked number 3, 4 and 17 as the districts with the highest IVIA at the national level

Historically, the Chilchos (an ethnic group originating from the Chachapoyas region), were transferred to Chetilla as mitimaes under the government of Túpac Yupanqui, maintaining their identity and traditions. They settled in several villages, dedicating themselves to agriculture and the maintenance of dairy farms, without fully integrating into the culture of Cajamarca. To this day, his legacy lives on in the traditions and traditional clothing of Chetilla. (23,24)

Chetilla is the eleventh poorest district in Peru, with a poverty incidence of 75.8% (20). Its population is distributed in 48 population centers at altitudes above 3,500 meters above sea level, where small agriculture and livestock predominate. Their diet is mostly based on carbohydrates from cereals, legumes, and local grains (20,21).

Our information comes from medical care plus abdominal ultrasound, considering that for the diagnosis of cholelithiasis it is essential to use clinical, analytical and radiological parameters, with abdominal ultrasound being

the most sensitive test for the location of lithiasis (1). Biliary lithiasis is a multifactorial disease whose incidence depends on genetic (25%) and environmental (75%) and epigenetic factors, which modify gene expression according to the environment. (3-5)

In the bivariate analysis of the study variables, we found the following:

**Study population:** Included adults of both sexes over 20 years of age, with a distribution of 78% women and 22% men. Age was not identified as a risk factor for cholelithiasis, although other studies suggest that the prevalence increases significantly with age and the presence of cholelithiasis in children under 20 years of age is very rare (25,26).

**In sex**, no clear statistical significance was found ( $p=0.056$ ), but the OR of 2.52 suggests a trend towards a higher probability in women. Various studies report that cholelithiasis, in all populations of the world, regardless of the general prevalence, women are almost twice as likely as men to suffer from cholelithiasis (4,5,8,25).

Our results suggest that males were associated with a lower probability of cholelithiasis with OR less than 1 and a  $p=0.040$  value, contrary to several studies (4,5,8,25). In **the male population**, the study could determine that rural lifestyle, intense physical work and lack of public transport, which is why they mostly walk, could influence a lower prevalence of cholelithiasis in men. In addition, their **Body Mass Index (BMI)** is healthier than that of women. It is reported that overweight and obesity are important risk factors in urban populations due to the energy imbalance between calories consumed and expended, in an environment of high sedentary lifestyle (30,31). In the case of rural men, such as the inhabitants of Chetilla, physical activity could be a protective factor against cholelithiasis.

**According to occupation, it was found that being a housewife was significantly associated** with an increased risk of cholelithiasis (OR = 2.51,  $p = 0.029$ ). Chetilla women, generally of short stature, with a predominance of abdominal overweight, would seem to remain mostly at home with some degree of sedentary lifestyle, plus their low educational level, a diet high in calories and fat, and a low socioeconomic level, all of which could contribute to this association (20,22).

**In our patients in the study, socioeconomic status** would be a more relevant risk factor than occupation in the prevalence of cholelithiasis. Several studies indicate that in communities with a higher level of development, the prevalence of cholelithiasis is lower (25,27). Globally, the prevalence of cholelithiasis decreases in high socioeconomic groups (32)

Our findings are similar to those found by Granizo (25), Tacuchi J (27), Olabarrera (28) and Suárez (29): no significant evidence was found that age, sex and occupation were related to the origin of cholelithiasis.

Only 35.89% of the women in Chetilla use contraceptives, and the bivariate analysis did not find a significant association ( $p = 0.614$ ). However, adolescent pregnancy rates and high multiparity remain high (21), although there is an increase in responsible parenthood due to the work of health personnel and teachers. Huilcapi (33) in a rural indigenous area of Ecuador found: a large part of women do not use any contraceptive method. In Peru, less use of contraceptive methods is reported in Puno, Huancavelica and Cajamarca (34).

The large multiparity (5 or more pregnancies) did not show a significant association with cholelithiasis. However, **having 2 or more pregnancies was significantly associated** with their development ( $p < 0.001$ ), which is consistent with other studies that suggest that the number of pregnancies increases the risk of cholelithiasis (10-12,15,16). Olabarrera (28) found non-significant results in: age over 50 years ( $P: 0.081$ ), No. of Children ( $P: 0.323$ ), Diabetes Mellitus ( $P: 0.405$ ) and Arterial Hypertension ( $P: 0.581$ ).

In cases of cholelithiasis, two women were pregnant, and bivariate analysis showed a significant association with the disease, which is consistent with other studies (10-12).

The bivariate analysis of the study found a significant relationship between overweight, diabetes mellitus, and a high-fat diet with the presence of cholelithiasis. The population studied mainly consumes cereal flours and local legumes with a high vegetable protein content, plus animal fats such as lard or poultry and vegetables from the area, with very little meat intake.

Saturated fats, present in meats and dairy products, have been linked to an increased risk of cholelithiasis, especially due to a high intake and low fiber intake, combined with factors such as a sedentary lifestyle, refined carbohydrate intake, and low socioeconomic status (13,14). However, the population studied consumes a diet with plenty of fiber from cereals, legumes, and vegetables.

Cholelithiasis increases in parallel with an increase in body mass index (BMI) (12,13,19) and this would be the most relevant risk factor, since the higher the body mass index, the higher the synthesis of cholesterol in the liver, which can cause supersaturation of bile and favor the formation of gallstones (7,10,11). In this study, overweight and obesity appear as significant risk factors.

Regarding diabetes mellitus, its prevalence in Chetilla is low (1.33%), and bivariate analysis was identified as a risk factor (OR=18,  $p=0.001$ ). Thus, although diabetes mellitus is not a predominant health problem in the population studied, its impact on cholelithiasis is considerable for those who suffer from it. In addition, the low percentage of diabetics could be due to specific characteristics of the community's diet and lifestyle, such as high

fiber intake and low refined carbohydrate intake. It would be important to investigate whether these habits have any role in the lower prevalence of diabetes.

Likewise, in our results, in the bivariate analysis, educational level and language do not show statistical significance as risk factors for cholelithiasis, similar to that found by Granizo (25), Tacuchi (27), Olabarrera (28) and Suárez (29).

Multivariate analysis and logistic regression identified overweight ( $B=1.40$ ,  $p=0.004$ ), obesity ( $B=1.34$ ,  $p=0.011$ ) and dietary fat consumption ( $B=0.94$ ,  $p=0.006$ ) as risk factors for cholelithiasis. In contrast, vegetable consumption showed a protective effect ( $B=-0.89$ ,  $p=0.048$ ), reducing the risk of developing the disease. These findings are consistent with previous studies worldwide (4,6,10,28,29).

Regarding the clinical manifestations, 63.66% of the population reported no symptoms, while 36.03% presented mild discomfort, mainly symptoms of dyspepsia such as indigestion, abdominal distension, borborigms and colic pain in the upper hemiabdomen triggered by feeding. Only four (8.88%) cases required cholecystectomy, and no patients reported severe cramping that warranted frequent medical attention. However, silent cases or cases with mild discomfort at a certain time could cause acute abdomen or obstruction of the bile ducts, leading to pathological processes that, if not detected in time, could cause even death (43)

### Characteristics of Gallstones

The gallbladder is an organ that stores and concentrates bile, located in the lower part of the liver. Its size varies according to muscle contraction. The formation of gallstones is due to three main factors: supersaturation of bile with cholesterol, crystallization accelerated by an imbalance between promoting and inhibiting factors, and alteration in gallbladder motility along with slow intestinal transit. Bile sludge results from the combination of mucin and cholesterol crystals. (18,19,35,36)

The study found that 31.11% of the cases presented signs of complicated chronic cholelithiasis, greater than 20%-25%, these are: single giant stone (none greater than 3 cm), full of stones with signs of scleroatrophy, thickened gallbladder wall and tumor involving gallbladder, of which 64% were asymptomatic, with a predominance in women, some under 30 years of age, and a high percentage of asymptomatic patients. This condition can lead to serious complications such as acute cholecystitis, choledocholithiasis, cholangitis, pancreatitis, gallbladder cancer (BVC), with a significant impact on health systems due to hospitalizations and surgical procedures (3-6).

Since 1990, disability-adjusted life years (DALYs) of gallbladder diseases have increased, with Central Latin America having the highest rates (37). Cholelithiasis is the main risk factor for gallbladder cancer, a rare but highly lethal disease that affects low-income populations the most. In Chile, this cancer is the third leading cause of death from malignant tumors in women. (3,6,38,39)

Indigenous populations, such as the Mapuche in Chile, face increased risk due to socioeconomic conditions and difficulties in accessing health care. The risk of developing gallbladder cancer increases with the size of the gallstones, being up to 10 times higher in cases with stones larger than 3 cm in diameter. In this study, 15.55% of cases have stones of 2 cm or more, but none of 3 cm or more. (38, 41,42).

A case-control study revealed that patients with gallstones of 2.0-2.9 cm have a 2.4-fold increased risk of developing gallbladder cancer, while those with stones of 3 cm or larger have a 10.1-fold increased risk (41,42). In this study, 15.55% of cases present with single stones of 2 cm or more in diameter.

### Prevalence of Cholelithiasis

In our study population, 300 patients aged 20 years and older, 78% women and 22% men, in a high Andean population of Quechua descent, Chilchos from the Chachapoyas region transferred as mitimaes to Chetilla by the Incas, we found a general prevalence of 15%, 17.09% in women and 7.57% in men. Logistic regression analysis showed that overweight, obesity, and fat intake pose an increased risk of biliary cholelithiasis, confirming the findings of previous population-based studies

Moro (15), in 1999, in a study to estimate the prevalence of cholelithiasis in three Peruvian rural villages with an altitude greater than 3000 meters above sea level in 911 patients over 15 years of age, found a prevalence in women of 18 to 20% and 4 to 10% in men, with the most significant risks being the increase in BMI and the use of oral contraceptives.

Another study by Moro (16), in 2000, studied the population aged 15 years and older in a peri-urban community of Lima, Peru, seeking to compare the prevalence of gallstones in natives of the coast, natives of the mountains and natives of the mountains who had migrated to the coast; It found a prevalence in women of 16.1% and 10.7% in men, although according to the age-adjusted prevalence it was not significantly different between coastal natives, migrants from the highlands and Andean settlers.

Cáceres (44) estimates that, in hospitals in Puno, Peru, an approximate incidence of cholelithiasis of 15 to 20%. In Peru, there are no studies on the prevalence of cholelithiasis, especially in the high Andean population.

Everhart (5) studying the North American Indian population (indigenous communities of Arizona, Oklahoma, and South and North Dakota), aged 45 years and older, found the highest prevalence rates of cholelithiasis: 64.1% in women and 29.5% in men, based on ultrasound study and cholecystectomy (according to ultrasound and self-report); found that Native American heritage and waist circumference were associated with cholelithiasis among men, and in women age, Native American heritage, diabetes, and parity; Unlike our study, body mass index was not independently associated with cholelithiasis in either sex.

In Mexico, Méndez Sánchez (8) found a prevalence of gallstones of 14.3%, higher in women (20.5%) than in men (8.5%), with body mass index, parity and age being the most significant risk factors.

Palermo (7) in a hospital in Buenos Aires, Argentina, found a prevalence of gallstones of 21.6%, with female sex, age, BMI, history of colic pain, family history of cholelithiasis, smoking, fatty liver and number of pregnancies being the most significant risks.

Soto (14), in Cuenca, Ecuador, found a prevalence of 44.9% in women of the Shuar ethnic group, with factors associated with overweight, pregnancy; frequent consumption of medications.

In Chile, Fonseca (6), studying in a sample similar to ours: 258 Aymara individuals, asymptomatic, over 18 years of age, 70.5% women and 29.5% men, reported a prevalence of cholelithiasis of 41.9% (48% in women and 28% in men) in the Aymara population, an ancient Andean people who inhabit the shores of Lake Titicaca, the Bolivian highlands, the Arica and Parinacota mountain ranges. Tarapacá, to northwestern Argentina

Miquel (45), in a study in Chile, comparing the frequencies of gallstones in three geographically and ethnically distinct Chilean populations aged 20 years or older: an urban area, Hispanics, from the south of Santiago (La Florida); a community of Mapuche indigenous people from Huapi Island, in Lake Ranco and a group of Chilean Maori residents of the city of Hanga-Roa, Easter Island. It found that the overall prevalence of gallstones adjusted for age and sex was higher in Mapuche (35%) than in Hispanics (27%) and Maori (21%) and concludes that lithogenic cholesterol genes, which would be widely distributed among Chilean and Hispanic Indians, could determine the early formation of gallstones and explain the high prevalence of gallbladder diseases among some South American populations. such as that of Chetilla in our study.

## CONCLUSIONS

1. The general prevalence of cholelithiasis in the high Andean population of the district of Chetilla, Cajamarca-Peru, in 2024, was 15%, being higher in women (17.09%) than in men (7.57%).
2. Risk factors were overweight, obesity, and fat intake.
3. The intake of vegetables and apparently the intense physical activity of the Andean male were protective factors.
4. 36.03% reported digestive or abdominal discomfort and 63.66% were asymptomatic.

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