

## RESEARCH ARTICLE

# Frequency of Cholelithiasis and Biliary Pathology in the Easter Island Rapanui and Non-Rapanui Populations

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### Abstract

**Background:** Chile is one of the countries with the highest prevalence of cholelithiasis worldwide, considering the Mapuche ethnicity as a risk factor for developing this pathology. Moreover, cholelithiasis is the main risk factor for developing gallbladder cancer, being the fifth cause of cancer death in Chile. The purpose of this study was to compare the frequency of cholelithiasis and biliary pathology among the population belonging to Rapanui ethnicity and non-Rapanui population living on Easter Island. **Materials and Methods:** In this retrospective case-control study, a total of 609 abdominal ultrasonographs performed consecutively in Hanga Roa Hospital during the period August 2012 to January 2015 were analyzed. Multiple logistic regression was used to obtain odds ratio (OR) and 95% confidence intervals (95% CI) of cholelithiasis and biliary pathology, adjusting for age, gender and referral diagnostic hypothesis. **Results:** In the Rapanui population the frequency for cholelithiasis and biliary pathology was 6.4% and 13%, meanwhile for the non-Rapanui population it was 13% and 22% respectively. Compared to the non-Rapanui Chilean population, the Rapanui ethnicity presented an OR of 0.53 (95% CI: 0.29-0.95) for cholelithiasis and OR of 0.52 (95% CI: 0.33-0.82) for biliary pathology. **Conclusions:** We found statistically significant ethnic differences in the frequency of cholelithiasis and biliary disease among the population of Rapanui and non-Rapanui ethnicity, so that this could be a protective factor for the development of biliary pathology, given the Chilean population context. Other studies including community population to determine the real prevalence of cholelithiasis and analyze the protective role of Rapanui ethnicity on this disease are necessary.

**Keywords:** Polynesia - cholelithiasis - biliary pathology - ethnic groups - Easter island

*Asian Pac J Cancer Prev*, 17 (3), 1485-1488

### Introduction

Easter Island is a small territory, which marks the eastern Polynesian triangle vertex, one of the most isolated places in the world and that is under Chilean sovereignty since 1888. It is for centuries the home of the Rapanui culture, unique in the world and of origin Polynesian, which has experienced a progressive fusion of the local ethnic groups with Chileans and Europeans mainly (Englert, 2009; Stambuk, 2010), resulting in the 6370 people who currently living on Easter Island (INE, 2015).

Chile is one of the countries with the highest prevalence of cholelithiasis worldwide, being estimated that at least 26.7% of the adult Chilean population has or had cholelithiasis (Latorre et al., 2015). Particularly for the habitants of Easter Island, it has been reported a prevalence of 21% of cholelithiasis in Rapanui population (Miquel et al., 1998). There is a lithogenic gradient between ethnic groups, being the Mapuche population the most affected, among other risk factors described (Latorre et al., 2015). This information is relevant considering that about 95% of Chilean population has some degree of genetic mixing

with the Mapuche ethnicity (Arcos-Burgos and Herrera, 2004). Moreover, cholelithiasis is the main risk factor for developing gallbladder cancer, being the fifth cause of cancer death in Chile, while this cause is uncommon in Rapanui population (Rius et al., 2013).

The ultrasound remains today the method of choice for the initial study of cholelithiasis and biliary disease, with sensitivity and specificity greater than 95% (McIntosh and Penney, 1980; Shea et al., 1994; Bortoff et al., 2000). It has the advantages of being a noninvasive test that does not use ionizing radiation, with easy access and low cost.

The purpose of this study is to compare the frequency of cholelithiasis and biliary disease among population belonging to Rapanui ethnicity and non-Rapanui residents living on Easter Island.

### Materials and Methods

A retrospective case-control study was performed. A total of 653 abdominal ultrasonographies performed consecutively in Hanga Roa Hospital during the period August 2012 to January 2015, excluding 44 patients under

**Table 1. Characteristics of the Analyzed Population**

	Rapanui (n=283)	Non- Rapanui (n=326)	Total (n=609)	P value
Gender				0.07 NS*
Male	89 (41.6 %)	125 (58.4%)	214	
Female	194 (49.1%)	201 (50.9%)	395	
Age (years)	43.4 ± 0.9 SD	45 ± 0.7 SD		0.13 NS**
Diagnostic Hypothesis				0.85 NS*
Biliary origin	53 (45.7%)	63 (54.3%)	116	
Other	230 (46.7%)	263 (53.3%)	493	

\*Chi-squared test; \*\*Mann-Whitney U Test; NS: no significative difference; SD: standard deviation

**Table 2. Frequency of Biliary Pathology by Ethnicity**

	Rapanui (n = 283)	Non-Rapanui (n = 326)	Total (n = 609)
Cholelithiasis			
Present	18 (6.4%)	37 (11.3%)	55
Absent	265 (93.6%)	289 (88.7%)	554
Biliary Pathology*			
Present	37 (13%)	72 (22%)	109
Absent	246 (87%)	254 (78%)	500

\*Biliary pathology: cholelithiasis or cholecystectomy history

**Table 3. OR of Cholelithiasis for Rapanui Ethnicity Relative to non-Rapanui Population, Adjusted by Gender, Diagnostic Hypothesis and Age**

	OR	Model 1 95% CI	P value	OR	Model 2 95% CI	P value
Ethnicity	0.55	0.30 - 0.98	0.045	0.53	0.29 - 0.95	0.035
Gender				1.61	0.85 - 3.09	0.145
Diagnostic Hypothesis				0.97	0.47 - 2.01	0.947
Age (years)						
15 - 31*				1		
32 - 39				1.12	0.47 - 2.67	0.796
40 - 48				1.34	0.58 - 3.07	0.486
49 - 58				0.92	0.37 - 2.27	0.851
≥ 59				0.65	0.23 - 1.84	0.415

\*Age range used for comparison.

**Table 4. OR of Biliary Pathology for Rapanui Ethnicity Relative to non-Rapanui Population, Adjusted by Gender, Diagnostic Hypothesis and Age**

	OR	Model 1 95% CI	P value	OR	Model 2 95% CI	P value
Ethnicity	0.54	0.35 - 0.83	0.003	0.52	0.33 - 0.82	0.005
Gender				2.39	1.45 - 3.93	0.001
Diagnostic Hypothesis				1.04	0.60 - 1.80	0.871
Age (years)						
15 - 31*				1		
32 - 39				1.47	0.64 - 3.38	0.359
40 - 48				3.14	1.47 - 6.67	0.003
49 - 58				2.89	1.33 - 6.27	0.007
≥ 59				4.40	2.02 - 9.53	0.000

\*Age range used for comparison

15 years of age, were analyzed. The variables considered were age (years), gender (female o male), the ethnicity (Rapanui o non-Rapanui), the diagnostic hypothesis of the treating physician, history of previous cholecystectomy or cholelithiasis, and echographic diagnosis of cholelithiasis consigned in the medical report. A single operator, general practitioner trained in abdominal ultrasound, performed the ultrasonographies. The diagnosis of cholelithiasis was corroborated by the report of the surgical biopsy after cholecystectomy.

In this study, was considered belonging to Rapanui ethnic group to the patients who carry at least one last name of Rapanui origin. The antecedent of cholecystectomy was provided by the patient and was checked with ultrasound examination. The diagnostic hypothesis was obtained from the medical request, grouped according suspected biliary pathology or not. The condition of biliary disease was considered in all the patients who had a history of previous cholecystectomy or that would be diagnosed with cholelithiasis after abdominal ultrasonography.

For the statistical analysis, the program Stata 9.0 was used. The quantitative variables were compared with Chi-square test, while for the age Mann-Whitney U test was utilized because the normal distribution of this parameter was rejected by Shapiro-Wilk test. For the analysis of the effect of the ethnicity on the frequency of cholelithiasis and biliary pathology, and adjust the size of the effect by gender, age and diagnostic hypothesis, we used an multiple logistic regression and were generated Odds Ratio (OR) and Confidence Intervals at 95% (95% CI), being set significance level at  $p < 0.05$  bilateral.

## Results

A total of 609 patients were analyzed, of which 46.5% belong to the Rapanui ethnicity. No statistically significant differences between Rapanui and non-Rapanui populations about gender, age and diagnostic hypothesis were found (Table 1). In the Rapanui population, the frequency of cholelithiasis and biliary pathology was approximately half of that found in the non-Rapanui population (Table 2).

When comparing both populations, adjusting for potentially confounding variables, it was found that the Rapanui ethnicity presented an OR of 0.53 (95% CI: 0.29 - 0.95,  $p < 0.035$ ) for cholelithiasis (Table 3) and OR of 0.52 (95% CI: 0.33 - 0.82,  $p < 0.005$ ) for biliary pathology (Table 4), compared to non-Rapanui population.

## Discussion

We found statistically significant ethnic differences in the frequency of cholelithiasis and biliary disease among the population and the Rapanui ethnicity and non-Rapanui, so that ethnicity could be a protective factor for the development of biliary pathology, given the Chilean population context. The importance of this point lies in the increased risk of gallbladder cancer in patients with cholelithiasis, so preventing their development and early diagnosis depend on detection of this major risk factor.

Of the 6370 inhabitants of Easter Island, 4805 are older than 15 years (INE, 2015), so eventually we analyzed to 12.7% of the eligible population, a number that we consider a representative percentage of the total population on this location. Considering that usually the most sick or symptomatic people come to the hospital, the frequency of biliary pathology in the Rapanui ethnic group population reached 13% in the sample analyzed in our study, lower than 21% prevalence of only cholelithiasis as previously reported (Miquel et al., 1998).

It is necessary to note that the island has the Hanga Roa Hospital as the only health center for the all the inhabitants, being the place where the ultrasonographic studies are performed. Only a small proportion of the people of Easter Island have the resources to travel to Continental Chile or French Polynesia for this type of test.

In this study is possible to identify several limitations to mention. Since this is a retrospective study was not possible to control other factors that might contribute to the analysis of the data obtained, for example, nutritional status of patients. There is a selection bias to include only patients who were referred by their physicians to perform abdominal ultrasonography, so the real community prevalence of cholelithiasis and biliary pathology is unknown. Another bias to mention is to assume that in all patients with prior cholecystectomy the indication was due to cholelithiasis, considering other conditions that justify this type of surgery. However, the most frequently histopathologic findings after cholecystectomy in Chile are due to cholelithiasis. (Seguel et al., 2007).

Performing abdominal ultrasonography by non-radiologist specialist, who has received appropriate training in this technique, has been shown to have proper diagnosis

performance in the outpatient and emergency setting, as has been suggested in several national and international experiences in urban centers and rural locations (Steinmetz and Berger, 1999; Catan et al., 2002; Wordsworth and Scott, 2002; Speets et al., 2006; Esquerra et al., 2011; Sippel et al., 2011; Del Carpio et al., 2012).

Previously Drapkin (1935) studied the genetic composition of the "Rapanui pure blood" and he estimated that most of them had Caucasian blood type. In our study, the great majority of Rapanui participants in the sample had only one name belonging to the ethnic group, and it was estimated that about 50% of the population currently residing in Easter Island does not belong to the ethnic group. This tendency could determine a progressive increase in the prevalence of cholelithiasis in the population, research topic for the future.

To consider the Rapanui ethnicity as a protective factor for cholelithiasis and biliary pathology in relation to the Chilean population, is necessary a prospective study incorporating community population both symptomatic and asymptomatic, in order to determine the actual prevalence of this disease and to make comparisons with more representative samples.

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