The Assessment of Health Literacy and Awareness of the Female Residents of Barangay Dagatan, Sabang, and Marauoy Lipa, Batangas on Polycystic Ovarian Syndrome: A Cross-sectional Study

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Abstract: Health literacy and awareness of Polycystic ovarian syndrome (PCOS) is a global issue that is under-addressed in the Philippines. Conducting a thorough review of the country's ability to recognize and comprehend the severity of the syndrome should be undertaken, as early treatment is essential to avoid further disorder complications. This research aims to assess the health literacy and awareness of the female residents of Barangay Dagatan, Sabang, and Marauoy Lipa, Batangas on PCOS. It followed a cross-sectional study, and data gathering was done through a pre-assessment using the Single Item Literacy Screener (SILS) and an online population-based survey questionnaire about PCOS awareness. The participants, as based on the objectives and purposive sampling method, were females aged 18-45 years old. Data were analyzed statistically using STATA 13.1 software. The study showed that 339 (76%) out of 444 respondents passed the SILS, meaning the residents have proficient health literacy. Among the 339 respondents, 87% (287) had previous knowledge about PCOS. The respondents showed awareness on less than half of the items on PCOS symptoms which could be attributed to its broad spectrum of information. Respondents were shown to be most knowledgeable about PCOS physiology, treatment, beliefs, and its remedies. The respondents' age had no significant association with their health literacy ($p=0.31$) and PCOS awareness ($p=0.60$). A significant association was noted, however, in their educational attainment linked with their health literacy ($p\leq0.0001$) and PCOS awareness ($p=0.001$). It is suggested that reproductive health education even in the lower year levels must be optimized, and LGU/NGO-held seminars should be conducted for knowledge reinforcement. Reliable health information should be more accessible to the public, and clinicians must emphasize the importance of the majority of early screening as part of routine physical examination for women of reproductive age to increase health literacy and awareness about PCOS and actively engage in the management of the disease.

Key Words:— ***Age, Awareness, Educational Attainment, Health Literacy, Polycystic Ovarian Syndrome (PCOS), Reproductive health, Single Item Literacy Screener (SILS).***

I. INTRODUCTION

Health literacy (HL), used in a general context, is a term concerned with the resources needed to access, comprehend, and utilize data and resources to make formal decisions regarding health [3]. To be health literate is an indication that one places his/her health, family, and community into context, comprehending the components that influence it, and having general knowledge on how to address them [1]. Consensus on disease indicates that it is viewed as a personal problem of individuals to bear responsibility. Others tend to view a condition as a moral failing, bad habit, or a consequence for bad behavior. Indeed, the social debate is apparent as seen from the disagreement regarding the legitimacy of public funding for those that warrant treatment

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[2]. Formed opinions on matters regarding health can source from personal literacy in general. As an example, the National Assessment of Adult Literacy (NAAL) provided domains of Health Literacy with the use of an approach of health-related mediums reflecting the type of mediums individuals encounter in a realistic sense. These examined domains: a.) prose literacy, or the ability to find, understand and use a sentence or paragraph data; b.) document literacy, or the ability to search, understand, and use information in different formats from the noncontinuous text. (such as job inquiry, payroll documents); and c.) quantitative literacy, or the ability to use numbers in print materials to conduct computations (such as calculating a tip, balancing a checkbook) [3].

The Protection motivation theory (PMT) and Precaution Adoption Process Model (PAPM) discuss health literacy and awareness in depth. PMT explores an individual's motivation for health-related decisions. Its domains are response efficacy and self-efficacy, which include the confidence of a person in the effectiveness of prevention and safety, and the former denotes the perception of health maintenance and improvement. The Precaution Adoption Process Model (PAPM) arises from PMT. PAPM is used to analyze and clarify the reactions of individuals to threats by analyzing 7 phases of how they cope. PAPM tries to unravel the mechanism of how an individual reaches and acts upon a decision. In terms of psychological processes that occur within individuals, the seven categories proposed for the model were defined. Instead of external causes, they are based on internal mental states. These phases illustrate the value of health literacy and understanding in making an effective and educated decision about one's health [85].

Health awareness research on endocrine, hormonal, and women's reproductive sectors indicates that there is still a significant lack of rigorous concern and systematic literature for the knowledge, behavior, and outcome that it entails [4, 5]. Delving deeply into female conditions, it was discovered that PCOS is a diagnosis for the majority population of hormonal disorders [7]. Polycystic Ovarian Syndrome (PCOS), an ovarian disorder of unknown etiology, accounts for 5- 10% of women in the US population and 50% of all cases of hirsutism associated with increased serum testosterone levels. [6, 7]. Nearly 70% of affected women have polycystic ovaries on pelvic ultrasound. PCOS prevalence is thought to be about 3-10 percent, but subpopulations dependent on location and ethnicity are largely unknown. As seen by the high degree of uncertainty and discrepancies in the diagnostic criteria, determining the condition's occurrence is a particular task. In addition to this, even after attending several health care facilities, a significant number of people remain undiagnosed. This raises significant limitations for most studies with limited sample size, selection bias, and cross-reference hindrance across studies.

Considering health literacy in the Philippines, Filipinos have the lowest rate (with 23.9% having poor confidence filling out medical forms by themselves) [9]. It is an evident pressing matter that the ability to make sound health decisions in the country is a currently neglected drawback and an even more troubling issue being paired with unawareness of hormonal disorders. The diagnosis of PCOS is met with three criteria, namely: (1) excess of androgen with hyperandrogenism or elevated testosterone; (2) ovarian dysfunction with oligo-anovulation or morphology of the polycystic ovary; and (3) lack of other causes of excess testosterone or anovulation, such as thyroid dysfunction, pregnancy, deficiency of 21 hydroxylases, secretion of neoplastic testosterone, Cushing syndrome, or hyperprolactinemia (high level of blood prolactin). Multiple factors influence the condition, with elevated serum insulin levels and obesity leading to the syndrome in 70 percent of women. Hypersecretion of both adrenal and ovarian androgen is usually present. Mental wellbeing is also not an exception; compared with age-matched controls, women with PCOS have a 35 percent chance of depression. Diabetes mellitus is also present in about 13 percent of the cases. Sleep apnea is particularly prevalent, and untreated women with amenorrhea have a greater risk of developing endometrial cancer. There is also hypertension and hyperlipidemia, which raises the chance of developing cardiovascular disease [6].

Readily accessed-for-request government documents regarding PCOS statistics in the Philippines are lacking, as the DOH Epidemiology Bureau currently does not collect data related to PCOS, regardless of the several data requests [14, 15]. In non-government-based data, however, a rising concern is also noted. Sixty-one out of 487 endometrial cancer patients have been found to have PCOS and are likely to develop it at a younger age compared to those without PCOS. The greater the BMI, the higher the incidence of endometrial cancer is for women with PCOS [10].

PCOS is a global issue that is poorly tackled in the Philippines, and with the considerable percentage of its global prevalence [7, 11], raising awareness and doing a thorough review of the country's ability to recognize and comprehend the degree of the syndrome should be carried out. Furthermore, proper

management and approach towards the disorder must be considered, both in government institutions and private entities, as it is a common issue that is neglected.

With the multi-dimensions of PCOS and duration of impact over the lifespan, it places a significant financial burden on health systems. In addition to such, affected women also suffer the burden of stigmatization, rooted in the non-conformity of societal expectations relating to femininity. As a result, affected women can be marginalized due to the health impacts of PCOS and frequently fall among the gaps in a specialty-focused health care system, with evident knowledge gaps among health care providers and irregularity with the service provided [13].

To the best of the researcher's knowledge, there is neither a population-based study that estimates the prevalence and clinical characteristics of PCOS in the Philippines nor a study that analyzes the health literacy of Filipinos regarding PCOS. Therefore, the study's objective was to determine residents' health literacy and awareness in various pinpointed Barangays about PCOS, appointed with the criteria of SILS [12] and PCOS awareness scale using a credible assessment of PCOS literacy parameters and profiles

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1 Theoretical Framework

The main theoretical framework of the study revolved around the Protection motivation theory (PMT) established in 1975 by Ronald Rogers. In general, PMT is directed towards an individual's motivation for health decisions. It centers on the factors that affect how an individual perceives risks about self-efficacy, behavioral aspects, and overall health. Primarily, the domains involved in this study are response efficacy and self-efficacy. The latter involves an individual's confidence in terms of prevention and protection efficacy, and the former denotes perception linked to health maintenance and improvement.

A branch theory relevant to the study, arising from the concept of PMT, is the Precaution Adoption Process Model (PAPM). The Precaution Adoption Process Model was initially established by Irving Janis and Leon Mann (1977). This is utilized to assess and explain people's responses to threats through the assessment of 7 stages of how they cope. It was first used to establish an individual's judgment on health considerations. PAPM attempts to unravel the process of how an individual arrives at a decision and acts upon it. The seven categories proposed for the model were defined in terms of psychological processes that occur within individuals. They are focused on internal mental states instead of external factors. At present, the model starts with the state of unawareness or lack thereof of the issue. The next stage involves little information acquired but with no engagement. At the third stage, people become engaged enough to consider their response to the problem and arrive at a decision-making perspective. Afterward, an individual may land on 1 of 3 outcomes once he/she has reached a decision. He/she may first suspend his/her judgment throughout the third stage. The fourth stage involves the second outcome wherein the individual chooses not to act upon the situation and postpone the precaution adoption process, in the meantime. The third outcome is the decision of the individual to adopt the precaution to proceed to the fifth stage. The action starts on the sixth stage. Lastly, the seventh stage ensures the maintenance of the developed behavior. [85]. These stages exhibit the relevance of health literacy and awareness to make a proper and informed decision in one's health.

2.2 Conceptual Framework

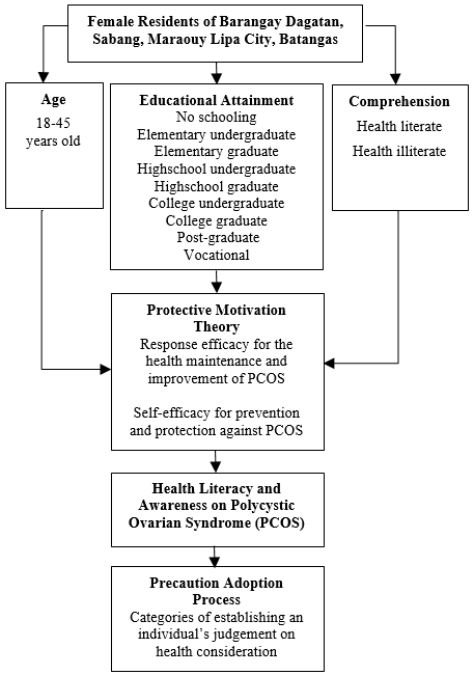

Fig.1. Paradigm of the Study

The figure seen above was the basis followed for the researchers' flow through the entire research period. The following variables have been determined with the objectives of the research. The data determined from the respondents, which were females from Barangay Dagatan, Sabang, Maraouy

Lipa City, Batangas. From there, the researchers gathered their age, educational attainment, and comprehension level on health literacy to see patterns from each of the participants' answers. This paved the way for the awareness of the female population, health awareness institutions, and the society, in general, with regards to PCOS. This will not only shed a light on the hormonal disorder but will also decrease the likelihood of its morbidity.

III. METHODOLOGY

3.1. Research Design

A cross-sectional study was conducted in the second quarter of 2021 in the three *barangays* in *Lipa* City, *Batangas* to assess the health literacy and awareness of the female residents of reproductive age (18-45) on PCOS. The study gathered demographic data of the target population, particularly their age and educational attainment, and determined its association with the health literacy of the respondents and their awareness of PCOS at a specific point in time. If the respondents agreed to the consent form, they will be asked to fill out a demographic questionnaire, a Single Item Literacy Screener (SILS) as a pre-assessment, and an online population-based survey questionnaire about PCOS Awareness adapted from a similar study. The SILS distinguished the respondents as health illiterate and literate. Those who did not pass this criterion (health illiterate) were automatically excluded from the PCOS Awareness survey and would be classified as unaware. If the respondents would have no prior PCOS knowledge after passing SILS, they would be categorized as health literate but unaware of PCOS.

3.2 Subjects and Study Site

This research implemented a purposive sampling scheme. Respondents were chosen based on location, age, and gender. A link to the survey along with a promotional poster for recruitment was disseminated to the respective media groups of the communities with the assistance of city councilors and administrators. Specifically, those included would be 18 to 45-year-old females. A total of 443 respondents from three *barangays* namely *Barangay Dagatan, Sabang*, and *Marauoy Lipa, Batangas* were studied. Sample size was computed using a 95% level of confidence. With a 60% estimated proportion of women with awareness of PCOS, based on the study of Alsinan and Ali Shaman 2017, at least 369 respondents were needed. A 20% allowance was added to come up with at least 443 respondents.

The formula is as follows:

$$n = \frac{(Z\alpha)^2\, pq}{e^2}$$

Where:

- n = is the number of respondents needed
- p = estimated proportion of women with awareness on PCOS = 60%= 0.60
- q = 1 – p = 1 – 0.60 = 0.40
- Zα = 95% confidence level = 1.96
- e = error of 5%

This was proportionally allocated with the three barangays selected for the study:

Table.1. Sampling size allocation as of May 2021 following the stated formula:

Barangay	Population	Population of women 18-45 y/o	Sample Size
Barangay Dagatan	5,347	961	84
Barangay Sabang	23,535	2,514	220
Barangay Marauoy	15,484	1,589	139
Total	*44,366*	*5,064*	*443*

Data gathering commenced for approximately one and a half months, from March 2021 to April 2021. Online forms were disseminated accordingly.

3.3 Data Measure/Instrumentation

The conducted research had two segments, with the first (SILS) done to determine the health literacy of the respondents, and the second segment (Awareness of PCOS) to identify how much they are educated with regards to polycystic ovarian syndrome.

SILS or the Single Item Literacy Screener is a straightforward instrument designed by Nancy Morris, Charles MacLean, Lisa Chew, and Benjamin Littenberg (2006) to identify patients with limited or marginal health literacy skills [12]. The instrument asks: "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?" with a Likert scale (i.e., 5 items), never, rarely, sometimes, often, and always. The "sometimes" item was recommended as the optimal cutoff point in determining respondents with limited health-related

reading ability. SILS performs moderately well at ruling out said respondents and allows the researchers to focus more on analyzing specific segments regarding their health literacy on specific topics.

The Awareness of Polycystic Ovarian Syndrome (PCOS) survey is an instrument designed to measure the level of knowledge of PCOS of the respondents. The instrument was formulated by Amal Alessa, Dalal Aleid, Sara Almutairi, Razan AlGhamdi, Noura Huaidi, Ebrahim Almansour, and Sheren Youns (2017) to assess the level of knowledge of PCOS (of females in Saudi Arabia), risk factors, and complications among Saudi female's population, to identify factors that influenced said awareness, and to improve upon the healthcare, and lower the cost of treatment for the disorder [87]. The questionnaire was designed using surveymonkey.com, a software used to create and run professional online surveys. A formal request was delivered to authors Amal Alessa and Amanl Ali Shaman for the utilization of the instrument for the researchers' study. The questionnaire consists of relevant segments of assessing PCOS awareness, namely the respondents':

- Previous knowledge about PCOS
- Method of knowing about PCOS
- Curiosity to learn about PCOS
- Awareness of the physiology of the female reproductive system
- Awareness of the symptoms of PCOS
- Awareness of the complications of PCOS
- Awareness of measures to decrease the symptoms of PCOS

Both instruments were incorporated in the questionnaire and formulated in Google Forms, an online survey administration software used for conducting research surveys.

3.4 Data Gathering Procedure

The respondents who were qualified and met the inclusion criteria were asked to answer an online survey form which consists of four parts: informed consent, basic demographic characteristics, the Single Item Literacy Screener, and the Awareness of Polycystic Ovarian Syndrome. The respondents were asked for their informed consent before proceeding to the main survey questionnaire.

The researchers utilized an online survey platform, google forms, as the main data collection and was disseminated to the respondents of *barangays Dagatan*, *Sabang*, and *Maraouy* of *Lipa* City, *Batangas*. Since the study was conducted while there is an ongoing global pandemic, COVID-19, and transportation to other places were restricted and would require the researchers to file medical forms to reach *Batangas* city, the researchers opted to use an online survey tool which would have less risk in the part of the researchers as well as the respondents. This would also be more efficient and less time-consuming since online surveys can be disseminated easily, and the results are recorded immediately on the online platform.

The survey form that was utilized upon conducting the study is a four-part survey comprised of the informed consent, demographics, and basic information, Single Item Literacy Screener as a pre-assessment questionnaire, and the Awareness of Polycystic Ovarian Syndrome which was the segment that gathered the data on the awareness and literacy of the respondents. The pre-assessment tool served as a screener in order to know which of the respondents are literate enough to understand and comprehend the questions on the second segment of the survey. The respondents who reached the optimal cutoff of the SILS will be able to answer the second segment of the survey. Respondents disqualified in the SILS questionnaire were considered as health illiterate, unaware, and were no longer further assessed.

3.5 Data Analysis

Descriptive statistics was used to summarize the demographics of the respondents. Frequency and proportion were used for categorical variables, while mean and SD for normally distributed continuous variables. A Chi-square test assessment was utilized to determine the association of the demographic characteristics with the respondents' health literacy and awareness of PCOS. ANOVA was used for the comparison of the level of awareness of the respondents following their demographic data (age and educational attainment). Missing variables were neither replaced nor estimated. The null hypotheses were rejected at 0.05α-level of significance. STATA 13.1 was used for data analysis.

IV. RESULTS

The purpose of the study is to assess (cross-sectional) the Health Literacy and Awareness of the Female Residents of Barangay Dagatan, Sabang, and Marauoy Lipa, Batangas on Polycystic Ovarian Syndrome.

The study participants have shared their literacy as regards to health-related information and awareness on PCOS. The research findings that this chapter reports are based on the analysis of the following data sources: Pre-assessment Single Item Literacy Screener (SILS) and a PCOS awareness survey questionnaire among female residents of Barangay Dagatan, Sabang, and Marauoy who are 18-45 years old.

Table.2. Demographic Characteristics of Respondents as of May 2021

Characteristics	Frequency (n)	Percentage
Age		
18 - 20	66	15 %
21 - 25	114	26 %
26 - 30	62	14 %
31 - 35	45	10 %
36 - 40	58	13 %
41 - 45	99	22 %
Educational Attainment		
No Schooling	0	0 %
Completed	0	0 %
Elementary	7	2 %
Undergraduate	32	7 %
Elementary Graduate	61	14 %
High School	101	22 %
Undergraduate	200	45 %
High School Graduate	17	4 %
College Undergraduate	26	6 %
College Graduate		
Post Graduate		
Vocational		

Table 2 shows the profiles for the respondents of the research that has been made to present the following criteria for choosing the participants. Among the age bracket, the majority was 26% which were 21-25 years old, and 22%, which were 41-45 years old. Furthermore, 15%, 14%, 13% and 10% were 18-20, 26-30, 36-40, and 31-35 years old, respectively. The educational attainment of the respondents was also assessed, and the majority were college graduates (45%).

Additionally, 22%, 14%, 7%, 6%, 4%, 2%, were college undergraduates, HS graduates, HS undergraduates, vocational, postgraduates, and elementary graduates, respectively. All respondents have received schooling and have at least graduated from elementary.

Table.3. Health Literacy of Respondents as of May 2021

Single Item Literacy Screener	Frequency (n)	Percentage
How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?		
Always	41	9 %
Often	64	14 %
Sometimes	184	41 %
Rarely	121	27 %
Never	34	8 %

The table above assesses the health literacy of respondents in terms of their capabilities to comprehend general materials from clinics and other health facilities without the help of others. 41% of the respondents sometimes ask for help whenever they are given such materials. 8% are capable of understanding the materials on their own, while 9% always require help to do so.

Table.4. Distribution of Respondents According to Their Awareness on PCOS as of May 2021

Question	Yes	No	I do not know
Did you have previous knowledge about polycystic ovarian syndrome (PCOS)?	287 (85%)	45 (13 %)	7 (2%)

Table 4 conveys the distribution of respondents according to their awareness of PCOS. Among the 339 respondents, 287 (87%) of the respondents had previous knowledge about PCOS, 45 (13%) of the respondents did not have any knowledge about PCOS, while 7 (2%) of the respondents said that they do not know.

Table.5. Distribution of Respondents According to Their Awareness on Basic Knowledge about the Physiology of Female Reproductive System as of May 2021

Questions	Yes	No	I do not know	Total Number of Responses
The follicle is a small fluid-filled sac	258 (76%)	26 (8%)	55 (16%)	339

with a single egg inside and the follicles are often called cysts				
Ovulating more frequently will improve my fertility	250 (74%)	36 (11%)	53 (16%)	339
After egg release (ovulation), the hormone progesterone is released; progesterone would allow my uterine lining to shed and allow me to have a normal menstrual period	222 (65%)	24 (7%)	93 (27%)	339
Having monthly increases in progesterone, and therefore menstrual periods would decrease my risk for cancer of the uterus	132 (39%)	91 (27%)	116 (34%)	339
The amount of fat in the body affects the amount of free testosterone in my body.	95 (28%)	109 (32%)	135 (40%)	339
Insulin helps the ovary to make more male hormone	42 (12%)	128 (38%)	169 (50%)	339

Table 5 shows the distribution of respondents according to their awareness of the basic knowledge about the physiology of the female reproductive system. The majority are aware of the concepts concerning ovulation unlike the questions regarding the association of the increase in progesterone and the risk of developing cancer of the uterus and the effect of fat and insulin on the production of male hormones (testosterone).

Table.6. Distribution of Respondents According to How They Became Aware of PCOS as of May 2021

PCOS Awareness as of May 2021	Frequency (n)	Percentage
How did you know about it?		
Someone I know has PCOS	161	47%
I read about it	78	23%
I have no knowledge of it	41	12%
I was diagnosed with PCOS	59	17%
Did you try to learn about PCOS using any of the following methods:		
Reading books or magazines	41	7%
Internet	225	39%
Asking someone who has PCOS	180	31%
Asking a doctor or a specialist	94	16%
I did not try to learn about pcos	33	6%

The frequency distribution of how the respondents became aware of PCOS is tallied and presented in table 6. The highest frequency among the categories with 47% of the respondents answered that they became aware of PCOS because they have someone that is diagnosed with PCOS. This is followed by the respondent having read about PCOS (23%), the respondent was diagnosed with PCOS (17%). Among the respondents who have answered the survey, 12% do not know about PCOS. The respondents were asked what methods they try to learn about PCOS, and the majority of the responses were through the internet (39%). They have also learned about PCOS using other methods such as asking someone who has PCOS (31%), asking a doctor or a specialist (16%), and reading books or magazines (7%). Among the respondents who have answered, 6% of them did not try to learn about PCOS.

Table.7. Distribution of Respondents According to Their Awareness on Basic Knowledge about Symptoms Associated with PCOS as of May 2021

Questions	Yes	No	I do not know	Total Number of Responses
Irregular menstrual cycle	313 (92%)	7(6%)	19 (2%)	339
Facial acne	259 (76%)	24(17 %)	56(7%)	
Hirsutism	123 (36%)	35(10 %)	181 (53%)	

Reduced fertility	285 (84%)	22(6%)	32 (9%)	
Weight gain	285 (84%)	15(4%)	39 (12%)	
Loss of hair in front of the head	149 (44%)	41(12 %)	149 (44%)	
Psychological disturbance	108 (32%)	165(49 %)	66 (19%)	
Diabetes	61 (18%)	123(36 %)	155 (46%)	
Hypertension	59 (17%)	129(38 %)	151 (45%)	
Abortion	41 (12%)	209(62 %)	89 (26%)	
Early puberty	41 (12%)	216(64 %)	82 (24%)	
Pain in the pelvic area	285 (85%)	15(4%)	37 (11%)	
There are no symptoms	14 (4%)	285(84 %)	40 (12%)	

The participant's knowledge of the symptoms associated with PCOS was assessed using the questions presented in Table 7. It can be found that the majority of the respondents were aware of the association of irregular menstrual cycle (92%), facial acne (76%), reduced fertility (84%), weight gain (84%), and pain in the pelvic area (85%) with polycystic ovarian syndrome. However, most of the respondents were also unaware of the association of other symptoms with PCOS such as hirsutism (63%), psychological disturbance (68%), diabetes (82%), hypertension (83%), and abortion (88%).

Table.8. Distribution of Respondents According to Their Awareness on Basic Knowledge about Complications Associated with PCOS as of May 2021

Question	Yes	No	I do not know	Total Number of Responses
Diabetes	133(39 %)	40 (12%)	166(49%)	339
Cardiovascular diseases	100(30 %)	57 (17%)	182(54%)	
Breast and Uterus cancer	280(83 %)	13(4%)	46(13 %)	
Increase of androgen levels	128(38 %)	22(6%)	189(56%)	
Anxiety	276(81 %)	16(5%)	47(14 %)	
Psychological Disturbance	235(69 %)	55(16 %)	49(15 %)	

Table.8. shows the distribution of respondents according to their awareness of basic knowledge about complications associated with PCOS. Respondents were mainly aware that breast and uterus cancer, anxiety, and psychological disturbance are complications associated with PCOS. On the other hand, the majority of the respondents were not aware that complications such as diabetes (12%, 49%), cardiovascular diseases (17%, 54%), and an increase in androgen levels (6%, 56%) are associated with PCOS.

Table.9. Distribution of Respondents According to Their Awareness on Basic Knowledge on Statements regarding the Physiology, Treatment, and Beliefs on PCOS as of May 2021

Question	Yes	No	I do not know	Total Number of Responses
PCOS is an inherited disease	175(52 %)	95(28 %)	69(20 %)	339
Regular ovulation leads to regular menstruation	260(77 %)	28(8 %)	51(15 %)	
Treating PCOS reduces the risk of developing cancers	297(88 %)	5(1%)	37(11 %)	
PCOS changes the shape of the ovaries	198(58 %)	32(9 %)	109(32%)	
PCOS affects ovulation	296(87 %)	10(3 %)	33(10 %)	

Awareness of Basic Knowledge on Statements regarding the Physiology, Treatment, and Beliefs on PCOS was assessed in Table 9. Results indicate that the majority of the respondents are aware that PCOS is inherited, Regular ovulation leads to regular menstruation, PCOS treatment reduces the risk of developing cancers, PCOS changes the shape of the ovaries and PCOS affects ovulation. Among the 339 respondents, 175, 260, 297, 198, and 296 answered Yes respectively for the given statements.

Table.10. Distribution of Respondents According to Their Awareness on Basic Knowledge on the Remedies to Reduce Symptoms of PCOS as of May 2021

Question	Yes	No	I do not know
Exercise	314 (93%)	5 (1%)	20 (6%)
Losing Weight	269 (79%)	36 (11%)	34 (10%)
Using contraceptives	233 (69%)	46 (14%)	60 (18%)
Eating vegetables and fruits	315 (93%)	3 (1%)	21 (6%)
Meals rich in protein	298 (88%)	5 (1%)	36 (11%)
Meals rich in fats	35 (10%)	241 (71%)	63 (19%)

Table 10 exemplified the respondents' awareness of the basic knowledge on the remedies to reduce symptoms of PCOS, wherein it showed that the majority of the respondents are aware of how to manage the symptoms of PCOS.

Table.11. Association of Demographic Characteristics with the Health Literacy of Respondents as of May 2021.

Age	N	R	S	O	A	Total	p-value
18-20	2 (3%)	15(23 %)	28 (42%)	13(20 %)	8(12 %)	66	0.31 (NS) (x^2= 22.63; df= 20)
21-25	1 (9%)	31(27 %)	50 (44%)	18(16 %)	5 (4%)	114	
26-30	8(13 %)	23(37 %)	17 (27%)	10(16 %)	4 (6%)	62	
31-35	2 (4%)	13(29 %)	20 (44%)	5(11 %)	5 (11%)	45	
36-40	7(12 %)	14(24 %)	23(40 %)	7(12 %)	7 (12%)	58	
41-45	5(5 %)	25(25 %)	46(46 %)	11(11%)	12(12 %)	99	
Total Number of Respondents	34	121	184	64	41	444	

Educational Attainment	N	R	S	O	A	Total	p-value
Elementary Graduate	0	0	0	4(57 %)	3(43 %)	7	<0.0001 (S) (x^2 = 162.9; df= 24)
High School Under-graduate	1(3%)	2(6%)	10(31 %)	11(34 %)	8(25 %)	32	
High School Graduate	0	6(10 %)	13(21 %)	24(39 %)	18(30 %)	61	
College Under-graduate	9 (9%)	28(28 %)	46(46 %)	12(12 %)	6(6%)	101	
College Graduate	22(11)	73(37)	93 (47%)	8(4%)	4(2%)	200	
Post Graduate	1(6%)	7(41 %)	7(41 %)	2(12 %)	0	17	
Vocational	1(4%)	5(19 %)	15(58 %)	3(12 %)	2(8%)	26	
Total Number of Respondents	34	121	184	64	41	444	

p = 0.05 - Not Significant; p ≤ 0.05 - Significant
Possible Test: Chi-Square Test
N - Never, R - Rarely, S - Sometimes, O - Often, A - Always

Table 11 conveys the association of the demographic characteristics with the health literacy of the respondents. The respondents' age (in years) had no significant association to their health literacy as indicated by the p-value of 0.31. Conversely, the educational attainment of the respondents showed a significant association to their health literacy as shown by the p value of <0.0001 wherein the majority of the respondents passed the SILS as they reached higher educational attainment.

Table.12. Association of Demographic Characteristics with the Awareness on PCOS as of May 2021.

Age (in years)	Yes	No	I do not know	Total Number of Respondents	p-value*
18-20	36 (80%)	7 (16%)	2 (4%)	45	0.60 (NS)
21-25	81 (89%)	8 (9%)	2 (2%)	91	
26-30	41 (85%)	6 (13%)	1 (2%)	48	
31-35	31 (89%)	4 (11%)	0	35	
36-40	34 (77%)	10 (23%)	0	44	
41-45	64 (84%)	10 (23%)	2 (3%)	76	
Total Number of Respondents	287	45	7	339	

Educational Attainment	Yes	No	I do not know	Total Number of Respondents	p-value*
High School Undergraduate	8 (58%)	5 (42%)	0	13	0.001 (S)
High School Graduate	15 (79%)	3 (16%)	1 (5%)	19	
College Undergraduate	71 (86%)	7 (8%)	5 (6%)	83	
College Graduate	164 (87%)	23(12%)	1 (1%)	188	
Post Graduate	15 (100%)	0	0	15	
Vocational	14 (67%)	7 (33%)	0	21	
Total Number of Respondents	287	45	7	339	

p = 0.05 - Not significant; p ≤ 0.05 - Significant Possible Test: Chi-Square test

Table 12 shows the association of the demographic characteristics in age and educational attainment with the awareness of PCOS. No significant association was noted between age and awareness of PCOS as shown by the p value of 0.60. On the other hand, a significant association was noted between educational attainment and awareness of PCOS (p=0.001). A significantly higher proportion of respondents with awareness of PCOS scores was seen among those with higher educational attainment.

Table.13. Comparison of the Awareness Scores According to the Demographic Characteristics of the Respondents as of May 2021

Age (in years)	n	Score (Mean± SD)	p-value*
18-20	45	18.44 ± 7.12	
21-25	91	19.78 ± 4.64	
26-30	48	19.17 ± 7.83	0.69 (NS)
31-35	35	19.14 ± 5.35	
36-40	44	18.46 ± 6.32	
41-45	76	18.33 ± 6.47	

Educational Attainment	n	Score (Mean± SD)	p-value*
High School Undergraduate	13	13.69 ± 8.04	0.001 (S)
High School Graduate	19	17.95 ± 7.52	
College Undergraduate	83	19.51 ± 5.64	
College Graduate	188	19.55 ± 5.59	
Post Graduate	15	19.93 ± 6.97	
Vocational	21	14.91 ± 7.92	

p=0.05 - Not significant; p ≤ 0.05 - Significant
Possible Test: ANOVA

Table 13 shows the awareness scores according to the demographic characteristics in age and educational attainment. No significant difference was noted in the awareness score according to age as shown by the p value of 0.69. On the other hand, there was a significant difference noted in the awareness score according to educational attainment (p=0.001). The awareness scores increase with increasing educational attainment which is also represented in Figure 5.

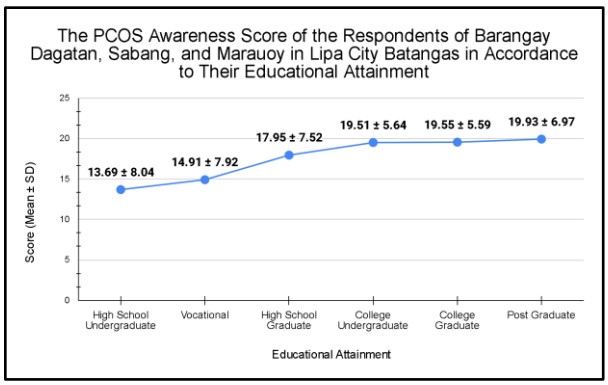

Figure.2. The PCOS Awareness Score of the Respondents of Barangay Dagatan, Sabang, and Marauoy in Lipa City Batangas in Accordance to Their Educational Attainment as of May 2021

Table.13.1 P Values for the Pairwise Comparison of the Awareness Scores According to Educational Attainments as of May 2021

Educational Attainment	p-value*
High School Undergraduate vs High School Graduate	0.050 (S)
High School Undergraduate vs College Undergraduate	0.001 (S)
High School Undergraduate vs College Graduate	0.001 (S)
High School Undergraduate vs Post Graduate	0.007 (S)
High School Undergraduate vs Vocational	0.570 (NS)
High School Graduate vs College Undergraduate	0.312 (NS)
High School Graduate vs College Graduate	0.272 (NS)
High School Graduate vs Post Graduate	0.342 (NS)
High School Graduate vs Vocational	0.113 (NS)
College Undergraduate vs College Graduate	0.958 (NS)
College Undergraduate vs Post Graduate	0.801 (NS)
College Undergraduate vs Vocational	0.002 (S)
College Graduate vs Post Graduate	0.812 (NS)
College Graduate vs Vocational	0.001 (S)
Post Graduate vs Vocational	0.014 (S)

p=0.05 - Not significant; p ≤ 0.05 - Significant Least Significant Difference (LSD) test

Since a significant difference in the awareness score was noted according to educational attainment as seen in table 13, a pairwise comparison analysis was carried out to determine where the differences lie. Table 13.1 shows the pairwise comparison of awareness scores according to educational attainment. It can be seen from the table that significant differences were noted when the mean awareness score of high school undergraduate students was compared to the awareness score of high school graduate students (p=0.047), college undergraduate (p=0.001), college graduate (p=0.001), and postgraduate students (p=0.006). The awareness score of high school undergraduate students was significantly lower in all comparisons. Similarly, significant differences were noted when the mean awareness score of vocational students was compared to the awareness score of college undergraduate (p=0.002), college graduate (p=0.001), and postgraduate students (p=0.015). The awareness score of vocational students was significantly lower in all comparisons.

V. DISCUSSION

A. Single Item Literacy Screener on Health Literacy

Health literacy is one of the many factors that influence an individual's health status. It can be a crucial motivational component to reduce problematic health behaviors and practices. As the health awareness of individuals increases, their health literacy also increases [105]. This indicates that as the researchers assess the health literacy of the residents of Barangay Dagatan, Sabang, and Marauoy in Lipa Batangas, it can be a determining factor whether they will be aware of polycystic ovarian syndrome or not. When their health literacy is found to be inadequate, then this stipulates that their awareness of PCOS will be limited.

The researcher's utilization of SILS was linked with the same concept utilized by Mohammadi et al. in Al-Ruthia's et al. (2015) study. As their data shows, participants who were male and had a high level of education were more likely to have a high level of health literacy than those who were female and had a low level of education. Older patients, on the other hand, had poorer health literacy scores than younger patients [28]. SILS helped in narrowing down the respondents that are health literate and are adequately capable of comprehending the proceeding information that is the PCOS awareness questionnaire.

The Single Item Literacy Screener consists of one question that gauges the level of health literacy of individuals when put in a situation that concerns making health decisions. It involves the ability to effectively use and interpret texts, documents, and numbers that will be encountered by an individual [106].

Out of the 444 respondents, 339 (76%) passed the Single Item Literacy Screener (Table 3) which means that majority of the residents of Dagatan, Sabang, and Marauoy Lipa Batangas have proficient Health Literacy in general. A considerable number of health illiterate respondents (105 (24%)) is still noted (Table 3).

The respondents' age (in years) had no significant association with their health literacy as indicated by the p-value of 0.31 (Table 11). Their educational attainment, on the other hand, showed a significant association to their health literacy as shown by the p value of <0.0001 (Table 11) wherein the majority of the respondents passed the SILS as they reached higher educational attainment. These findings can be explained in congruence with the ability to understand health information which influenced the relationship between educational attainment and health behavior [104]. This entails that an individual achieves a more adept health literacy as he/she achieves a higher educational background.

Health literacy in its sense is crucial in reproductive health as it can impel behavior and outcomes [5]. With that in mind, polycystic ovarian syndrome is a significant matter that can be addressed appropriately once an individual is considered health literate.

B. Polycystic Ovarian Syndrome Awareness

Polycystic Ovarian Syndrome (PCOS) is known to be a complex reproductive and endocrine disorder. It is multifactorial and has indefinite pathogenesis. It affects about 5-20% of the female population and presents a variety of symptoms including Hirsutism, pelvic pain, and enlarged ovaries [57,108]. It is further associated with multiple complications like hypertension, liver disease, and infertility among others [40,41,42].

Due to the scarcity of polycystic ovarian syndrome studies in the Philippines, as far as the researchers are aware, there is no definitive data regarding the prevalence of PCOS in specific areas. As such, there is no known venue with current information regarding PCOS. Hence, three (3) barangays - Barangay Dagatan, Sabang, and Marauoy of Batangas, a developing city, were chosen. A study named "City Profile: Batangas City, Philippines" by Delos Reyes states that it has been doing well as opposed to its neighbors and the Capital city, Manila. It is further stated to have constructed a plethora of schools compared to DepEd [109]. Its rural and urban nature along with its high population predisposes it to a higher prevalence of PCOS as a lifestyle disorder [36].

Among the 339 respondents, 87% (287) had previous knowledge about PCOS (Table 4). Such knowledge could be attributed to Table 6, which involves the acquisition of PCOS information. It exemplifies how the respondent knew about PCOS and if they had tried learning more about PCOS. As such, the most common source of PCOS knowledge is the respondent knowing an individual diagnosed with PCOS, followed by the respondent reading about PCOS or themselves being diagnosed with PCOS (Table 6). The highest distribution of gained knowledge about PCOS is through the use of the internet, followed by asking patients and doctors about it and lastly reading about it in books (Table 6).

Regarding the Awareness on Basic Knowledge about the Physiology of the Female Reproductive System, the respondents displayed awareness on half of the items (Table 5). The majority were aware of topics involving basic characterization of follicles, the relationship of fertility to the frequency of ovulation, and progesterone released after ovulation. But only 39%, 28%, and 12% knew about the association of increased frequency of menstrual period to the decreased risk of endometrial cancer, the effect of the fat amount to the amount of free testosterone in the body, and the function of insulin with regards to the release of the male hormone, respectively (Table 5). These three items are imperative information because they contribute to the comorbidities associated with the disease. An increased risk of endometrial cancer is linked to the decreased levels of progesterone. Supporting this, a study states that type 1 adenocarcinoma is the most common form of cancer where-in it is estrogen-dependent, it is due to the chronic exposure of estrogen with minimal opposing effects of progesterone [111]. Fat is directly associated with free testosterone levels in the body when it comes to females. The higher the weight, the greater the testosterone levels [112]. Furthermore, A High level of Free Testosterone index in PCOS is known to be affected by a high level of fat and testosterone in the body [113]. High levels of Testosterone in turn are associated with hirsutism as well as hyperandrogenism [114, 115]. Both of which are known complications of PCOS. [53,58] [79].

The consistency of wrong assumptions about insulin and testosterone in a sense can be rationalized by their interconnected functions. If the respondent does not know that Insulin aids in the production of male hormones (testosterone), it can be inferred that the respondent will not recognize that an elevated amount of insulin will produce increased levels of testosterone, a symptom associated with PCOS, as well [116]. Moreover, insulin levels contribute to the development of diabetes as one of the complications associated with PCOS (Table 8). Insulin resistance can also develop into a variety of cardiometabolic abnormalities such as dyslipidemia, hypertension, glucose intolerance, diabetes, and metabolic

syndrome which consequently increases the risk of acquiring Cardiovascular Diseases [117].

On the subject of PCOS symptoms, the respondents showed awareness on less than half of the items (Table 7). They did not know about the majority of the given symptoms. For PCOS complications, the respondents showed awareness on half of the items (Table 8). Such results reiterate the broad spectrum of PCOS symptoms and complications which necessitate information dissemination regarding the disease.

Respondents were shown to be most knowledgeable about PCOS physiology, treatment, and beliefs as compared to other categories regarding PCOS (Table 9). As for the remedies to reduce the symptoms of PCOS, the respondents knew almost all of the given items (Table 10). The item that they were unaware of was the consumption of "meals rich in fat" (Table 10).

For awareness in association with the demographics, age has been shown to have no significant association ($p=0.60$), whereas educational attainment proved to be significant ($p=0.001$) (Table 12) as those individuals with higher educational attainment had significantly higher awareness of PCOS. Each specific level of educational attainment was graded in terms of awareness score. The highest awareness scores were seen among post-graduates, college graduates, and college undergraduates (Figure 5). These results align with data from another cross-sectional study, wherein educational attainment was attributed to how an individual discerns PCOS information. There was a higher likelihood for individuals with higher educational attainment to seek information from certified websites and journals as they were conditioned in their respective educational practices [110]. The lowest awareness scores for PCOS were seen among high school undergraduates and vocational graduates (Figure 5). Low awareness scores could be attributed to a lack of information as these graduates are least likely to consult with medical professionals for information regarding PCOS [110]. This is further supported by another study that shows a direct correlation between PCOS awareness with Educational Attainment. Those with a higher level of education were classified to have a greater level of awareness as compared to respondents with lower educational backgrounds [87].

Overall, the main factor that affects PCOS Awareness in this study is educational attainment (Table 13). Out of the 339 respondents, 83, 188, and 15; College undergraduates, college graduates, and postgraduates respectively were the most knowledgeable about PCOS among the group (Table 13). As shown in the pairwise comparison, most of the respondents are somewhat knowledgeable but a significant difference was seen among the scores of the highest scorers and the lowest scorers (Table 13.1). The awareness scores of both high school undergraduates and vocational graduates are significantly lower (Table 13.1).

VI. CONCLUSION

The limited local study on PCOS and its poor information dissemination contribute to the poor recognition of the disease. This necessitates the assessment of the health literacy and awareness on PCOS to the residents of barangay Dagatan, Sabang, and Marauoy of Lipa City, Batangas. Accordingly, through the gathered data and analysis, the researchers conclude that majority of the residents of the three barangays of Lipa City, Batangas are health literate and are aware of PCOS as shown in the data where 76% passed the pre-assessment SILS and the majority of the residents answered 62% of the survey questions on health awareness on PCOS correctly. The considerable number of health illiterate respondents represented by (24%) of the 444 who answered the SILS are still noted. The two demographic characteristics namely, age and educational attainment, were considered which contributes to the literacy and awareness of the respondents on PCOS. However, upon data analysis, there was no significant association between the age of the respondents with regards to their health literacy and awareness of PCOS. Whereas there was a significant association between the educational attainment of the respondents with their health literacy and awareness of PCOS, where the score of the respondents increases in the higher levels of educational attainment. Since the awareness levels of respondents rely heavily on their educational attainment possibly because of information discernment, more emphasis should be directed towards proper recognition of health information especially in the early education of young women as they enter their reproductive maturity.

As the study focused only on the female respondents from three barangays representative of Lipa City, it is recommended for future studies to include the assessment of the health literacy and PCOS awareness of both men and women from NCR and other areas of the country. A larger sample size is also suggested for future studies to determine if there is an association between the respondents' age and health literacy and PCOS awareness. Since an online survey was disseminated, it is also possible that the respondents may have

depended on the Internet which may have increased the respondents' health literacy and PCOS awareness. Thus, future studies should consider conducting interviews to gather data. To eliminate possible biases on the health literacy and PCOS awareness of women, future researchers should also consider the respondents' field of study if they are from the healthcare field or not. In addition, the data gathered may also be used as statistical information for future studies about PCOS in the Philippines. Since there was an association between the respondents' educational attainment and health literacy and PCOS awareness, it is suggested to optimize women's reproductive health education even in the lower year levels by including a more comprehensive course in the curriculum. As previously mentioned, the common source of information for women of the target population was from the Internet. Thus, to increase the health literacy and PCOS awareness of women, it is important to make health information more accessible to the public while ensuring that the source of information is also reliable. To ensure the consolidation of the information gathered from online resources, it is also encouraged that LGUs or NGOs conduct seminars/webinars and medical missions advocating for women's reproductive health education while emphasizing the benefits of early screening. Clinicians will also play an integral role in emphasizing the importance of including early screening as part of the routine physical examination for women of reproductive age. Being able to do so will not only increase the patient's health literacy and awareness about the physiology, risks, symptoms, and complications associated with PCOS but will also enable the patients to actively engage in disease management.

Ethical Considerations

All subjects gave their informed consent for inclusion before they participated in the study. The study protocol was approved by the Faculty of Pharmacy Research Ethics Committee (Reference Number: FOP-ERC-2021-01-044).

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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