

The Diagnostic Value of Anti-Müllerian Hormone and Follicular Stimulating Hormone in Polycystic Ovary Syndrome Patients

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Abstract

Objective: To evaluate the anti-müllerian hormone (AMH) and follicular stimulating hormone (FSH) in polycystic ovary syndrome patients (PCOS) and their potential as markers of PCOS.

Methods: This was a comparative cross-sectional study carried out on 80 women aged 18-50 years: 40 were healthy women with non-polycystic ovary syndrome serving as control group and 40 were patients with PCOS. Fasting venous blood (6 ml) was collected from each individual in the second day of the menstrual cycle and AMH, FSH, luteinizing hormone (LH), prolactin and estradiol (E2) as well as fasting blood glucose (FBG) and lipid profile were measured.

Results: Serum AMH was significantly ($p = 2 \times 10^{-4}$) higher in PCOS patients by 3.5-folds with respect to the control group, whereas FSH was significantly ($p = 0.01$) lower by 36.5%. In contrast, LH, prolactin, estradiol, FBG and the lipid profile were non-significantly different between the two tested groups. Serum AMH was negatively correlated with age ($r = -0.355$, $p = 0.001$) and FSH ($r = -0.454$, $p = 2 \times 10^{-6}$).

Conclusion: This study shows that AMH can be used as a diagnostic and prognostic marker in PCOS.

Keywords: Polycystic ovary syndrome, Anti-Müllerian hormone, Follicular stimulating hormone.

I. INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrinopathy that is prevalent in 5-10% of women of childbearing age [1]. It is characterized by oligo- or hyperandrogenemia, and polycystic ovarian ultrasonography [1,2]. It is clinically manifested as menstrual thinning, hemorrhoids, hairiness, obesity and infertility. It is also characterized by abnormal levels of reproductive hormones, which can lead to anovulatory, infertile and menstrual disorders [1,3]. About 50% of women with PCOS fulfill the criteria of metabolic syndrome and that PCOS is frequently associated with insulin resistance accompanied by compensatory hyperinsulinemia, resulting in an increased risk for the development of Type 2 DM and cardiovascular disease [2,4]. In comparison with healthy women, PCOS have higher level of anti-müllerian hormone (AMH) that is a peptide produced by granulosa cells of follicles that is widely

considered as a highly sensitive marker of ovarian reserve [4]. Anti-Müllerian hormone is a dimeric glycoprotein belonging to the transforming growth factor β (TGF- β) superfamily [5]. It has also been proven that it has a strong influence on the function of ovaries, especially on the growth of follicles [6,7]. Anti-Müllerian hormone is supposed to regulate the number of growing follicles and their selection for ovulation [8] and is a negative regulator of early stages of the follicular development [9]. Moreover, AMH inhibits the recruitment and growth of follicles by restricting growth factors and the effect of gonadotropins, especially the follicle-stimulating hormone (FSH) [10]. The level of AMH can reflect the number of ovarian antrum follicles, ovarian reserve, and ovarian function [11]. Serum AMH is not affected by menstrual cycle and oral contraceptive use, so it has potential as a marker for the diagnosis of PCOS [12]. Studies have shown that the level of circulating AMH is two- to threefold higher in women with PCOS than in healthy women of childbearing age, probably due to increased follicular mass associated with PCOS [8,9]. In view of the fact that the increase in AMH levels has been reported to be associated with PCOS as well as longterm effect of PCOS, the aim of this study was to explore the diagnostic value of AMH and other hormones in Yemeni patients with PCOS.

II. MATERIALS AND METHODS

The study was a comparative cross-sectional study that was carried out on 80 women aged 18-50 years: 40 were healthy women with non-polycystic ovary syndrome serving as control group and 40 were patients with PCOS attending the University of Science and Technology Hospital and C-Pluse Hospital in Sanaa city for infertility evaluation during the period from September 2015 to February 2016. PCOS was diagnosed based clinical and biochemical signs of hyperandrogenism (HA); and presence of polycystic ovaries (PCOs), defined as the presence of ≥ 12 follicles measuring 2-9 mm in diameter in each ovary and/or increased ovarian volume (> 10 ml). The exclusion criteria were as follows: Cushing's syndrome, dysfunctional uterine bleeding, primary amenorrhea, adrenal cortical hyperplasia or tumor, thyroid

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dysfunction. The study protocol was approved by the institutional review board (IRB) of the Faculty of Medicine and Health Sciences, Sana'a University. Informed consent form was obtained from all individuals after explaining the purpose and nature of the study. The patients' height and weight were measured and body mass index (BMI), defined as weight (kg)/ height squared (m²), was calculated. Standardized questionnaire(s) was administered to collect participants' demographic and clinical data. Venous blood (6 ml) was collected from each individual after an overnight fast of more than 10 hours in the second day of the menstrual cycle and divided into two vacuumed tubes; 4 ml into plain tubes for immediate measurement of AMH, FSH, Luteinizing hormone (LH), prolactin and estradiol (E2); and the remaining 2 ml for biochemical analysis. The serum from each sample was separated within 30 minutes and immediately stored at 20°C.

III. BIOCHEMICAL ANALYSIS

Fasting blood glucose (FBG), triglyceride (TG), total cholesterol, HDL-cholesterol (HDL-c), and LDL-cholesterol (LDL-c) were measured on an automated analyzer, the Cobas Integra 400/400 (Roche Diagnostic, Germany), using the respective Roche Diagnostic kits. The AMH, FSH, LH, prolactin and E2 were measured by Electrochemiluminescence reagent kit on the Cobas e411 Immunoassay (Roche Diagnostics, Germany).

IV. STATISTICAL ANALYSIS

The statistical analyses were performed on Social Package of Social Sciences (SPSS) version 2000 (SPSS Inc, Chicago, IL, USA). Results were expressed as means \pm SD and analyzed by independent sample t-test. Pearson correlation used to measure the correlation as well as the sensitivity, specificity and accuracy of AMH, FSH, and LH. The significant difference was indicated if p value was < 0.05.

V. RESULTS

The results presented in Table 1 show the biochemical and hormonal parameters in polycystic ovary syndrome patients. Anti-mullerian hormone was significantly ($p = 2 \times 10^{-4}$) higher in PCOS patients by 3.5-folds as compared with the control group, whereas FSH was significantly ($p = 0.01$) lower by 36.5%. In contrast, LH, prolactin and estradiol were non-significantly different between the two tested groups. Similarly, FBG, TG, cholesterol, HDL-c and LDL-c levels were non-significantly different between the two groups.

Table 1: Biochemical and hormonal parameters of PCOS patients and control subjects

	Control (n = 40)	PCOS (n = 40)	p-value
Age (years)*	32.20 \pm 5.68	30.43 \pm 4.58	0.12
BMI (kg/m ²)*	24.67 \pm 3.98	25.67 \pm 5.03	0.32
Triglyceride (mmol/L)	1.14 (1.0 – 1.3)	1.17 (1.0 – 1.3)	0.87
Cholesterol (mmol/L)*	4.24 \pm 0.96	4.22 \pm 0.85	0.92
HDL-c (mmol/L)	1.0 (0.88 – 1.23)	1.0 (0.8 – 1.54)	0.21
LDL-c (mmol/L)*	2.70 \pm 0.9	2.60 \pm 0.8	0.69
FBG (mg/dl)	93.0 (79.4 - 100)	100.0 (100 - 109)	0.19
AMH (ng/ml)	1.27 (1.25 – 2.0)	4.5 (3.8 – 6.0)	2x10⁻⁴
FSH (MIU/ml)	7.40 (5.6 -9.5)	4.7 (3.8 – 6.0)	0.01
LH (IU/L)	6.1 (5.0 – 7.7)	7.5 (6.3 – 10.0)	0.19
Prolactin (ng/ml)	14.7 (12.5 – 15.8)	16.9 (12.5 – 19.9)	0.26
Estradiol (pg/ml)	47.86 31.6 – 63.0)	57.54 (39.8 – 63.0)	0.23

Data are expressed as geometric mean (95% confidence interval of mean); * Expressed as Mean \pm SD

Table 2 shows the Pearson correlation between anti-mullerian hormone and other tested parameters in PCOS patients. Of all the parameters tested, AMH was negatively correlated with age ($r = -0.355$, $p = 0.001$) and FSH ($r = -0.454$, $p = 2 \times 10^{-6}$).

Table 2: Pearson correlation between anti-mullerian hormone with age and with FSH in PCOS patients and non-PCOS women

Variables	R	p-value
AMH- age	- 0.355	0.001
AMH – FSH	- 0.454	2x10⁻⁶

*P-Value ≤ 0.05 s considered significant.

Table 3 shows the sensitivity, specificity and accuracy of AMH, FSH and LH tests in the diagnosis of PCOS.

Table 3: Sensitivity, specificity and accuracy of AMH, FSH and LH tests

	Sensitivity	Specificity	Accuracy
AMH	60%	96%	88.8%
FSH	27.5%	86%	27.5%
LH	27.5%	93%	79.9%

VI. DISCUSSION

The results presented in our study showed the AMH level to be significantly higher in PCOS patients, which is in agreement with several studies [13-16]. This increase could be attributed to increased production by individual follicles in women with PCOS [17]. Early antral follicles are increased in numbers in women with PCOS that leads to increase production of AMH [18]. Anti-mullerian hormone production was reported to be approximately 75times higher in each polycystic ovarian granulosa cells [13]. Moreover, increased mRNA expression of AMH levels were found in PCOS, also caused by disturbances in folliculogenesis, resulting in the accumulation of excessive pre-antral and small antral follicles [19]. Our study also showed significant negative correlation between AMH and age which is in agreement with a previous study [20]. This may be due to decline in the follicular reserve of the ovaries [21]. Moreover, our result showed significant negative correlation between AMH and FSH PCOS, which is in support of the suggestion that AMH inhibits the responsiveness of follicles to FSH mediated by AMH RII that induces adenyl cycles activation and aromates expiration [18,22,23].

On the other hand, FSH was significantly lower in women with PCOS which is in agreement with an earlier study [18]. This decrease in FSH may be due to suppression effect (decrease production) or increase serum level of AMH in PCOS patients. The increase of AMH inhibits the recruitment of the primary follicle and diminishes the response of selected follicle to FSH stimulation [7]. In contrast, serum levels of LH were non-significantly different in PCOS patients, which are in disagreement with a previous study reporting increased level of LH in PCOS women [24] and suggesting that it was due to arrested folliculogenesis. Moreover, another study demonstrated that AMH directly increased LH pulsality and secretion, machinated by AMHR II receptors on the surface of GnRH neurons [25]. Similarly, estrodial showed no significant difference in the PCOS group, which is disagreement with an earlier study reporting reduction of E2 production in PCOS women [24] due to the increase relationship between serum level of AMH and E2. The AMH affects E2 production by decreasing the aromatase activity [26]. The lack of effect in LH and E2 levels in our study may be attributed to the fact that all our patients were under treatment.

The sensitivity and specificity of AMH was 60% and 96%, respectively, which is in agreement with previous studies [27,28] reporting a sensitivity and specificity of 67% and 92% respectively. On the other hand, the sensitivity of both FSH and LH were less at 27.5%.

12. Conclusion

The results presented in this study show that AMH may have potential as a marker of PCOS and therefore can be used as a diagnostic and prognostic marker tool in PCOS patients.

VII. REFERENCES

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Surgical Management of Acquired Subglottic Stenosis in Patients Attending Al-Thawrah Teaching Hospital

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Abstract

Background: Subglottic stenosis is one of the most complex and challenging issues in the field of otolaryngology. The management involves a multidisciplinary approach with multiple procedures. The main aim of the management is to keep the airway patent and preserve voice production. The aim of the study was to evaluate the results of treatment methods of subglottic stenosis.

Methods: The prospective study was conducted on 40 patients between January 2012 and March 2018 at

Otorhinolaryngology Department, Al Thawra Teaching Hospital, Sana'a, Yemen.

Results: Of the subglottic stenosis patients studied, 30 (75%) were male and 10 (25%) were female. The mean age was 18.6 years. High incidence of 60% was found in the age group (15-24 years) while less was found in the age group >34 years (7.5%). Grade III stenosis represented (50%) and grade IV (25%). Endoscopic dilation was successful in grade I (100%) and grade II (80%). The external approach was successful in 18/31 (58.1%), while the success rate in all grades was (67.5%). About 50% of the patients were presented with tracheostomy in place.

Conclusion: Acquired subglottic stenosis causes airway compromise and significant morbidity to the patients. The management involves a multidisciplinary approach with multiple procedures. A large number of endoscopic and open procedures are currently in use for the treatment of this condition. There is no single method of treatment that is universally successful. Results of treatment are not very satisfactory due to multiple factors.

Keywords: : Bronchoscope, endotracheal intubation, endoscopic dilation, external approach subglottic stenosis, otolaryngology.

VIII. INTRODUCTION

Subglottic stenosis (SGS) is the narrowing of the subglottic lumen. It can be acquired or congenital. The etiology of acquired SGS is related to the trauma of the subglottic mucosa. Injury can be caused by infection or mechanical trauma, usually from Endotracheal intubation but also from blunt, penetration or other trauma [1-3]. Laryngeal stenosis is one of the most complex and challenging problems in the

field of head and neck surgery. Laryngeal stenosis with airway compromise causes significant morbidity to the patients and is difficult to treat in both adult and pediatric population [4]. Often the results of these operations are not very satisfactory due to multiple factors. There have been many procedures and equal numbers of modifications for the treatment of laryngeal stenosis which in itself show that no one of the procedures is standard and treatment operations can vary according to the need of the patient [5]. Recurrence rates remain high at 40 - 70% over a period of months to years [6].

This has led to a focus on different modalities to increase patency rates and the development of many technological improvements over the past decades [7]. There are various treatments that have been reported in the medical literature. Several different surgical procedures have been used to treat subglottic stenosis, but are generally categorized into endoscopic dilatation, resection of stenosis, and open neck surgery with cartilage incision [8].

The aim of this study was to evaluate the results of acquired subglottic stenosis treatment.

IX. PATIENTS AND METHODS

This is prospective study included 40 patients complaining of subglottic stenosis, carried out in OtorhinoLaryngology Department, AL-Thawra Teaching Hospital, Sana'a, Yemen during the period from January 2012 to March 2018. Ethical approval was obtained from the medical ethics committee of our Department. Written consent was obtained from all patients. All patients underwent history taking, clinical examination, radiological evaluation (Xray, CT, MRI), and endoscopic evaluation (fibreoptic, rigid laryngoscopy, bronchoscopy, oesophagoscopy). The results were statistically analyzed as data were processed using SPSS statistical software, where t-test and chisquare were applied for analysis. A p-value <0.05 was considered statistically significant.

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X. TECHNIQUE

A combined technique of both endoscopic and anterior cricoid split approaches was performed on all cases under general anesthesia. Endoscopic approach was firstly done to dilate the stenotic part using a rigid bronchoscope or balloon. Then, an anterior transverse neck incision was made at the level of the cricoid cartilage. Subplatysmal flaps were elevated superiorly to the thyroid notch and inferiorly to the suprasternal notch. The strap muscles were separated vertically in the midline and retracted laterally. The anterior cricoid ring was divided vertically with either a knife or a saw, according to the degree of ossification. The goal was to open the lower part of the stenotic segment. To maximally preserve the voice, great care was experienced in order not to extend the incision to the anterior commissure. Submucosal resection of scar tissues was attempted meticulously to avoid scar regeneration that could happen if much mucosa has been damaged. The Montgomery Tracheal T-Tube of outer diameter 10-12 mm was inserted in the interior of the larynx. T-tube left for 6-8 weeks (Fig. 1), or costal cartilage inserted into the anterior part of the cricoid cartilage (Fig. 2).



Figure 1.T-Tube.

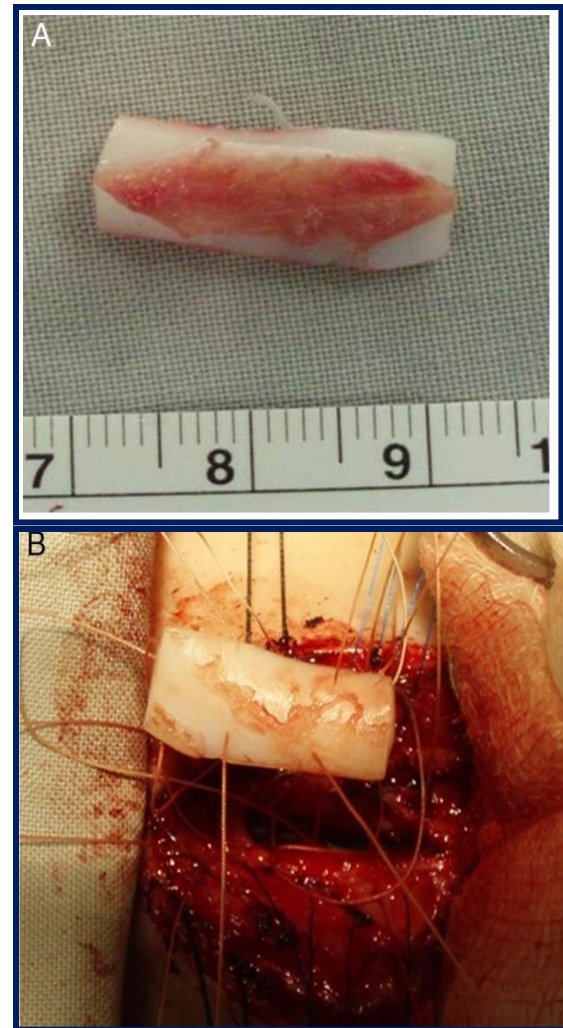


Figure 2: Costal cartilage. (A) preparation, (B) insertion.

XI. RESULTS

A total of 40 patients were enrolled in the study. Males 30 (75%) and females 10 (25%). The age range was 5-60 year with mean age of 18.6 years. Age groups of the patients were shown in table1. High incidence of subglottic stenosis 24 (60%) was found among the age group 15-24 years. Grade III stenosis was found in 20 patients followed by grade IV in 10 patients and fewer number in grade I and II (Table 2).

Table 1: Distribution of patients according to age

Age Groups	No	%
5-14	5	12.5

15-24	24	60
25-34	8	20
>34	3	7.5
Total	40	100

History of endotracheal intubation in all patients, with different duration of the intubation; ranged from 1-4 weeks. All grade IV and 10/21 of grade III were presented with tracheostomy in place. All patients had undergone rigid bronchoscopy under general anesthesia to confirm the diagnosis, grading, type and extension of stenosis, and dilatation if possible. Endoscopic dilatation was successful in 100% of grade I, 80% of grade II and one patient of grade III. This patient had membranous type of stenosis and underwent 3 times dilatation (Fig. 3). A total of 31/40 (grade IV, 20 of grade III, and 2 patients of grade II) underwent external surgical approach (laryngotracheoplasty) anterior cricoid splitting with cartilage insertion, however T-tube was inserted in 4 patients. The success rate of external approach (77.5 % of patients) was 18/31 (58.1%). The overall success rate of all grades was (67.5%) 27/40 of the patients. Follow up ranged from 1-3 years. Regarding the grading of subglottic stenosis according to Cotton's classification was showed in (Table 2).

Table 2: Distribution of patients according to Cotton's grading of subglottic stenosis

Grade	No	%
I (up to 50%)	2	5
II (51-70%)	8	20
III (71-99%)	21	52.5
IV No hole	9	22.5
Total	40	100

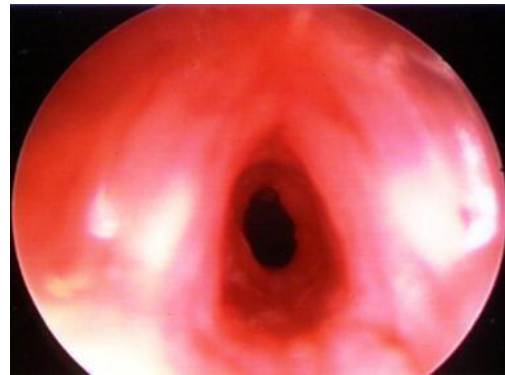


Figure 3: Subglottic stenosis, grade III

XII. DISCUSSION

As the subglottic region is the narrowest part of the larynx, it is the most common site of laryngeal stenosis. SGS is a condition that can cause severe patient morbidity as airway obstruction causes respiratory distress and difficulty breathing. Subglottic stenosis continues to provide significant challenges in treating specialists, primarily due to the regrowth of granulation tissue at the site of intervention or at the anastomotic site [10,11]. Subglottic stenosis is one of the most common causes of upper airway obstruction. Almost 90% of them result from endotracheal intubation. Acquired SGS is more common and results from prolonged endotracheal intubation in more than 50% of the cases. Autoimmune disease and idiopathic etiology can account for 18% of the cases [12]. Therapy depends on the degree of stenosis, among other factors. Therapeutic approaches range from watchful waiting in mild stenosis to complex surgery for severe cases [13]. The main findings show that Laryngotracheal resection with anastomosis decreases additional surgery and increases the rate of decannulation when compared to endoscopic procedures and laryngotracheal augmentation/ expansion grafting. Patients with idiopathic stenosis are less likely to receive additional surgery compared with those with trauma or intubation/ tracheostomy as the cause of stenosis. Lack of additional surgery is commonly considered the ultimate goal of treatment for laryngotracheal stenosis [14]. The treatment of SGS is difficult with the requirement of multiples interventions before successful outcomes can be achieved [15]. High prevalence of subglottic stenosis occurred in the age group (15-24) 60%, and less in middle age (7.5%) and males more than females. Grade III represented a high incidence (50%) followed by grade IV (25%) in this study. Acquired SGS was treated by multiple methods, dilatation was used in grade (I, II) gave a high success rate (81.1%) after more than two times. While used in grade III, as a primary step to improve breathing for a short time 2-4 weeks then underwent to open procedure. This agreement with previous studies was reported that dilatation of grades I, II, gives a high success rate [16,17]. More concerns were raised in another recent comparative study by Mareschal et al (2014) [18] who stated that there is a poor definition of the safety profile for balloon dilatation. They believed that the procedure carries

risks of warning the stenosis, affects airway tissue integrity, and in particular increases the chance of needing urgent intervention.

T-tube was used in 4 patients with good success rate (50%). T-tube provides a stable and physiologic airway to the patient and can be kept in the place for long periods of time to follow up the progress of patients till the time of decannulation can be considered [19]. It can be used primarily as definitive treatment, or in the management of the inoperable conditions, or as an adjunct after resection anastomosis till adequate healing is achieved. Splitting of the cricoid cartilage given successful rate (58.1%) in our study this is in agreement with the previous study [4]. The factors that are related to the development of stenosis with a shorter duration of intubation are the large size of the tube, high pressure in the cuff, not deflating the cuff periodically, frequent replacement of the tube. Restless patient and infection around cuff site [21]. There should be a sense of realism both for the surgeon as well as for the patient regarding the expected results of surgery. Patients with minor stenosis should also realize that laryngeal manipulation may be occasionally leads to additional scarring and the requirement of tracheostomy. Often the patients suffering from this condition undergo multiple surgeries and should be warned that the results of treatment of chronic laryngeal stenosis may be unrewarding and their tracheostomy may be permanent [4].

Laser is mostly used for ablation of granulation tissue and laryngeal and subglottic web for dilation of stenosed area; however, wound healing can result in restenosis. Dilation could be indicated as first line treatment for SGS grades III. They considered that endoscopic treatment does not interfere with future surgical Treatment [22].

XIII. CONCLUSION

Acquired subglottic stenosis causes airway compromise and significant morbidity to the patients. A large number of endoscopic and open procedures are currently in use for the treatment of this condition. There is no single method of treatment that is universally successful. Results of treatment are not very satisfactory due to multiple factors.

XIV. DISCLOSURE.

No conflict of interests and the work was not supported or funded by any company.

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Angiographic Characteristics of Young Yemeni Patients Undergoing Diagnostic Coronary Angiography: Data from A Major Cardiac Center in Yemen

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Abstract

Background: Coronary artery disease (CAD) accounts for the greatest proportion of CVDs and is one of the most common causes of death in the developed countries. It is one of the main etiologies of disease burden in developing countries. There is increase in the number of patients with coronary artery disease in Yemen. The number of patients undergoing elective diagnostic coronary angiography is increasing among different age groups. This study was aimed to identify and compare the prevalence of the risk factors, clinical presentation, management, and angiographic characteristics of CAD between young patients (age ≤ 40 years) and older patients (age ≥ 40 years) presented with ischemic heart disease (IHD). **Methods:** A total of 555 patients were enrolled between January 2013 and June 2013. Patient admitted in ward as one-day admission and discharged 6 hours after the procedure. Demographic data, clinical findings, and details of electrocardiographic and echocardiographic findings were recorded. The traditional cardiovascular risk factors (smoking, hypertension, Khat chewing, family history and diabetes mellitus, dyslipidemia) were noted. The patient included were patients with stable angina, post myocardial infarction and pre-operative coronary angiography before valve replacement. **Results:** The older group accounts for 90.3% while younger group accounts for 9.7% of the patients. The majority of patients in both groups were male (81.5% in the young and 74.5% in the older group). Most of the patients in the study were diagnosed as post MI angina. High incidence of diabetes and hypertension among the older group in comparison to the younger group (24.4% diabetes and 43.1% hypertensive Vs. 11.1% diabetes and 29.6% hypertensive). 50% of the younger group were smokers in comparison to 23.8% in older group with statistically significant difference ($p=0.0001$). Family history of IHD was higher in the younger age group (24.1%) than that in the older age group (16%) ($p = 0.129$). Dyslipidemia was not common risk factor among both groups. The percentage of Khat chewing did not differ between the two groups (70.4% and 62.5% in younger and older group respectively). Significant left main disease was more than double in younger group (3.7%) when compared older group (1.9%). About one-third (31.5%) of patients of younger group had significant LAD lesion while small number of older patients had significant LAD lesion (1.6%) ($p = 0.037$). The involvement of right coronary artery (RCA) was significantly higher in older group than in younger group (27.7% and 7.5% respectively; with $p = 0.001$). Although the incidence of left circumflex artery (LCX) disease was higher in older group (28.8% and 16.7% respectively) it did not reach statistical significance. The left anterior descending artery (LAD) was commonly involved vessel in the young group (31.5%) in comparison to older group (1.6%) while left circumflex artery and right coronary artery was common in the older group. **Conclusion:** Coronary angiography is a useful diagnostic and therapeutic tool for CAD. Smoking, male gender as

well as family history of cardiovascular diseases showed high prevalence in the in younger patients ≤ 40 years, while hypertension and diabetes were common in the older patients. Khat chewing was highly prevalent among both groups.

XVI. INTRODUCTION

Coronary artery disease (CAD) accounts for the utmost proportion of CVDs and is the main cause of mortality in the developed countries as well as in developing countries. Three-fourths of global deaths due to CAD occurred in the low and middle-income countries [3,4]. The major risk factors for coronary artery disease include hypertension, cigarette smoking, diabetes mellitus, elevated cholesterol levels, and obesity. The prevalence of those important risk factors varies greatly according to geographical region, sex, age and ethnic background. [5-7]. The variation in disease prevalence from region to another is likely a result of many non-traditional risk factors. Some investigators proposed considering khat chewing which is common habit among Yemenis as a risk factor for CAD as it was associated with a higher mortality rate and complications such as cardiogenic shock, heart failure, recurrent ischemia, and stroke despite a lower prevalence of cardiovascular risk factors, including diabetes mellitus and prior CVD [8-12]. To date there is no information available on the different aspects of ischemic heart disease in young patients in Yemen. In the present study we identify risk factors, mode of presentation, treatment and angiographic profile of CAD in younger ischemic heart disease patients.

XVII. PATIENTS AND METHODS

The cardiac center in Al-Thawra hospital is the major referral center for cardiovascular diseases and surgeries in Yemen. Patients are referred for diagnostic coronary angiography from different cities as well as from other hospitals. Personal data, clinical examination, electrocardiography and echocardiography were documented on catheterization laboratory forms filled by either cardiologist or trained practitioner. The traditional cardiovascular risk factors (smoking, hypertension, Khat chewing, family history, diabetes mellitus and dyslipidemia) were noted. This was a prospective observational study conducted from January 2013 to June 2013. A total of 555 patients were included in the study. Patient admitted in ward as one-day admission and

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discharged 6 hours after the procedure. The patient included were patients with stable angina, post myocardial infarction and pre-operative coronary angiography before valve replacement. A written informed consent signed by the patients and his or her relatives was obtained before the procedure. The study was performed with approval from the Ethical Committee of the cardiac center in Al-Thawra Modern General Teaching Hospital Coronary angiography was performed through femoral and occasionally through radial artery.

XVIII. RESULTS

In our observational and comparative study, a total of 555 participants underwent diagnostic coronary angiography. We divided them according to age into two groups (≤ 40 years old as younger group and age ≥ 40 years old as older group). The older group was 501 and accounts for 90.3% of the patients while the younger group was 54 and accounts for 9.7%. The majority of patients in both groups were male (81.5% and 74.5% in younger and older group respectively). The mean age of the whole study population was (54.7 ± 10.26). In younger group was (36.8 ± 3.7) years and in older group (56.7 ± 8.7) ($p = 0.321$). Most of the patients in both groups were married (98.1% and 96.0% in younger and older group respectively) with no statistically significant difference. Most of the patients (64.8%) in the younger group and 48.1% in the older group were post MI angina ($P=0.01$), while 14.8% of the patents in the younger group and 37.3% in the older group had stable angina (SA) $P=0.001$. Ejection fraction did not differ significantly in both groups ($p=0.566$). Table (1)

Table 1: Baseline characteristics of patients

	Young Group (n =54)	Older Group (n = 501)	p
Mean age	36.76 \pm 3.7	56.65 \pm 8.7	.001
Male	44 (81.5%)	373 (74.5%)	0.32
Female	10 (18.5%)	128 (25.5%)	
Marital status			
Married	53 (98.1%)	480 (96.0%)	0.15
Education (Yes)	41 (75.9%)	218 (43.5%)	.001
Indication			
Post MI*	35 (64.8%)	231 (48.1%)	0.01
SA	8 (14.8%)	179 (37.3%)	0.00

Pre-op	9 (16.7%)	65 (13.5%)	0.41
CM	2 (3.7%)	5 (1.0%)	0.14
ECHO Findings			
EF			
<50	23 (42.6%)	237 (47.7%)	0.57
>50	31 (57.4%)	260 (52.3%)	

*MI: Myocardial Infarction- SA: Stable Angina- Pre-op: Pre-operative- CM: Cardiomyopathy- EF: Ejection Fraction

23.8% of the older group were smokers in comparison to 50.0% in younger group statistically significant difference ($p=0.000$). Hypertensive patients were (29.6%) in younger group and (43.1%) in the older group ($p = 0.06$). The prevalence of diabetes was high in the older age group (24.4%) in comparison to the younger age group (11.1%) ($p = 0.027$). Dyslipidemia was not common risk factor among both group with no statistically significant difference between the two groups (26.2 and 22.7 in older and younger group respectively). The incidence of family history of IHD was observed to be higher in the younger age group (24.1%) than that in the older age group (16%) ($p = 0.129$). The percentage of Khat chewing did not differ between the two groups (70.4% and 62.5% in younger and older group respectively) ($p = 0.3$) (Table 2).

Table 2: Distribution of risk factors

	Younger Group (n = 54)	Older Group (n = 501)	P Value
DM *	6 (11.1%)	122 (24.4%)	0.027
HTN	16 (29.6%)	216 (43.1%)	0.06
Dyslipidemia	10 (22.7%)	100 (26.2%)	0.692
Smoking	27 (50.0%)	119 (23.8%)	0.001
Khat chewing	38 (70.4%)	313 (62.5%)	0.30
FH	13 (24.1%)	80 (16.0%)	0.129

DM: Diabetes mellitus – HTN: Hypertension – FH: Family History ¥ Missed data: Patients had lipid profile done in older group only 381 patients

Our study showed significant left main disease was more than double in younger group (3.7%) when compared older group (1.9%). about one-third (31.5%) of patients of younger group had significant LAD lesion while small number of older patients had significant LAD lesion (1.6%) ($p = 0.037$). The involvement of right coronary artery (RCA) was significantly higher in older group than in younger

group (27.7% and 7.5% respectively) with $P = 0.001$. Although the incidence of left circumflex artery (LCX) disease was higher in older group (28.8% and 16.7% respectively) but did not reach statistical significance ($P = 0.59$).

It is found that the left anterior descending artery (LAD) was commonly involved vessel in the young group (31.5%) in comparison to older group (1.6%) while left circumflex artery and right coronary artery was common in in the older group (Table 3).

Table 3: Coronary characteristics in the patients

	Younger Group (%)	Older Group (%)	P Value
LM			
Normal	51 (94.4%)	484 (96.6%)	0.418
Not Significant	1 (1.9%)	7 (1.4%)	0.790
Significant	2 (3.7%)	8 (1.6%)	0.269
LAD ¥			
Normal	26 (48.1%)	484 (96.6%)	0.100
Not Significant	11 (20.4%)	7 (1.4%)	0.530
Significant	17 (31.5%)	8 (1.6%)	0.037
LCX			
Normal	37 (68.5%)	283 (56.6%)	0.089
Not significant	8 (14.8%)	73 (14.6%)	0.962
Significant	9 (16.7%)	144 (28.8%)	0.059
RCA			
Normal	37 (68.5%)	277 (55.3%)	0.062
Not Significant	12 (22.6%)	85 (17.0%)	0.334
Significant	4 (7.5%)	139 (27.7%)	0.001

¥ LM: Left main coronary artery, LAD: Left Anterior Descending Artery – LCX: Left Circumflex Artery – RCA: Right Coronary Artery

XIX. DISCUSSION

Coronary artery disease (CAD) remains the commonest cause of mortality worldwide (14) It becomes more frequent in young age people than it was in the past [15]. Many studies showed that younger patients have significant hypercholesterolemia; positive family history [16] as well as history of smoking in comparison with older patients [17]. In our study, most patients in both groups were male (81.5% and 74.5% in younger and older group respectively). Same incidence was seen in Nadeem et al and Shahid et al [18,19].

Myocardial infarction was common in this study as most of the patients 64.8 in younger and 48.1% in the older group were post MI angina, while 14.8% of the patents in the younger and 37.3% in the older group had stable angina

(SA). This is very important as the risk recurrent MI and cardiovascular death were the most frequent events as it was seen by some studies [20,21]. As reported data show that smoking is the commonest risk factor encountered in young patients with acute myocardial infarction, it was also common in young group of our study [22-25]. Family history was dominant in young group that is in consistence with the data that shows family history of premature MI has been considered as an independent risk factor for the development of cardiovascular events, particularly in young patients [2629]. Unsurprisingly diabetes was common among the old group in our study as most studies [30-33].

Hypertension was more prevalent in older group when compared to younger CHD patients that are nearly the same in study done by Nesligul et al. The study revealed that HTN prevalence was 47% and 22% in older and younger group patients respectively [25]. The prevalent was higher in the older group in Abu Siddique study and showed ratio of 2:1 [33].

Dyslipidemia in the term of high triglyceride, high LDL and low HDL shows lower incidence in both groups, which is in correlation with other previous studies [25,31]. Khat chewing which is commonly used habit among Yemenis did not differ in the two groups, which indicates higher prevalence of Khat chewing in Yemeni community and carry a high risk of acute myocardial infarction [34,35].

The study showed that the left anterior descending artery (LAD) was commonly diseased in the young group (31.5%) which is in consistence with the study done by Nafakhi and shows 41.5% LAD disease in young patents [36] while left circumflex artery and right coronary artery was common in in the older group.

XX. CONCLUSION

In our study, male gender, smoking, and family history of cardiovascular diseases were high in the younger patients (≤ 40 years). On the other hand, the older patients had more hypertension, and diabetes. Khat chewing was highly prevalent among both groups. Most of the patients in both groups whom scheduled for diagnostic coronary angiography were post MI that reflects the big defect in utility of primary PCI in our hospital.

XXI. RECOMMENDATION

Dominance of smoking that is the most modifiable risk factor in premature CAD in young patients indicated that awareness of smoking must be taken. Establishing primary PCI facilities should be considered as timely managed young patients with AMI have favorable in hospital prognosis.

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Prevalence Of Malaria Among Blood Donors in The National Center for Blood Transfusion and Research in Sana'a Yemen

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Abstract

Background: Malaria has been killing millions of people worldwide. World Health Organization estimates that there are 300 million to 500 million of people infected with malaria. Therefore, the aim of this study is to explore the prevalence of malaria parasites among the blood donors attending the National Center for Blood Transfusion and Research in Sana'a, Yemen over a period of 6 months. **Methods:** Data collected from the National Center for Blood Transfusion and Research records for the year of 2012 and 2020. Secondary data were taken from 12,000 donors from 2012 and 18,000 from 2020. The records contain the patient's number, blood bag, type of examination: cassette and confirmatory tests such as ELISA and type of malaria test. **Results:** In 2020, there were 814 Malaria-infected blood donors (97.8%), whereas, in 2012, there were only 18 Malaria infected blood donors (2.2%). The male donors more infected (99.2%) than female donors (0.8%). The number of donors with blood group O+ were the highest infected people (50.4%), while the least infected donors is AB- (0.1%). The number of infected people with Plasmodium falciparum (24%) is the highest compared with other types of malaria (4%). The most packed cell volume (PCV) ratio among donor was 49%, the lowest PCV ratio in donors is 95% and 60% respectively. **Conclusion:** The study showed that the war played a significant role in increasing the number of people suffering from malaria and that the situation is worsening due to lack of awareness, migration and weak economic conditions.

Keywords: : Malaria parasite; Blood donors; Prevalence, Blood group, Infected, Civil war

XXIII. INTRODUCTION

Malaria killed millions of people worldwide. World Health Organization estimates that there are 300 million to 500 million of people infected with malaria so that, malaria is a serious situation that we have to over shine the light on it. Malaria is a serious and sometimes fatal disease caused by a parasite that commonly infects a certain type of mosquito,

which feeds on human [1-3]. Malaria is spread in Africa, India, eastern, and south Asia and it cause mortality for millions of peoples most of them are children. This disease caused by many parasites but only five types infects human which are Plasmodium falciparum, Plasmodium ovale, Plasmodium malaria Plasmodium vivax and Plasmodium knowlesi. The most common types in Yemen are Plasmodium vivax and PATIENTS AND METHODS

Coronary artery disease (CAD) accounts for the utmost proportion of CVDs and is the main cause of mortality in the developed countries as well as in developing countries. Three-fourths of global deaths due to CAD occurred in the low and middle-income countries [3,4].

The major risk factors for coronary artery disease include hypertension, cigarette smoking, diabetes mellitus, elevated cholesterol levels, and obesity. The prevalence of those important risk factors varies greatly according to geographical region, sex, age and ethnic background. [5-7]. The variation in disease prevalence from region to another is likely a result of many non-traditional risk factors. Some investigators proposed considering khat chewing which is common habit among Yemenis as a risk factor for CAD as it was associated with a higher mortality rate and complications such as cardiogenic shock, heart failure, recurrent ischemia, and Plasmodium falciparum. The danger of malaria being reintroduced is always present [2-4]. Malaria is transmitted also by blood transfusion, sometimes malaria infect people and cause no symptoms. These asymptomatic, parasitaemic people maybe they are donors in blood transfusion. That's why human nowadays consider it the most dangerous transmitter disease ever, especially in transmutates malaria. Human malaria is the most common vector-borne disease in Yemen, with an annual incidence of about 900,000 cases and approximately 60% of the total population considered to be at risk of the disease [1]. Plasmodium falciparum accounts for 95% of the cases and, although Anopheles arabiensis is the predominant vector, An. culicifacies plays an important role

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in malarial transmission in the coastal areas of Yemen and another known vector species [3]. In Yemen Malaria appears in southerliness and coastal areas like Al-Hodeida, Aden, Tehama, and Taiz. Predominance of malaria in Yemen is usually accompanied with many reasons. There are many special groomed for spreading malaria such as seasons. In rainy season, malaria becomes out of control due to swamps and stagnant water. More also absents of neatness, absents of realization and absence of government care are causals for having malaria [4-6]. It is unclear why febrile patients in the highlands of Yemen are much more likely to be found to have malarial infection than their counterparts from the coastal plains and foothills. Although it is possible that malarial transmission is relatively intense in the highlands, it seems more likely that they are less immune to malaria, and therefore more likely to develop febrile illness following malarial infection. Whatever the cause of the symptomatic malarial infection commonly found in the highlands of Yemen, it is a matter of serious concern that should be addressed in the national strategy to control malaria. Therefore, the aim of this study was to explore the prevalence of malaria parasites among the blood donors attending the National Center for Blood Transfusion and Research in Sana'a, Yemen.

XXIV. MATERIALS AND METHODS

Data Collection:

Data collected from the National Center for Blood Transfusion and Research during the period from February – July 2021. The records contain the patient's number, blood bag, type of examination: [cassette] and confirmatory tests such as ELISA and type of malaria ex. P. Falciparum and P. vivax. The other information was taken from the cards e.g. Date of diagnosis, Age, Sex, Blood group, and laboratory investigation: Hb, PCV The study was approval by the Ethical Committee at AlHikmah University and from the committee at the National Center for Blood Transfusion and Research.

Data analysis:

Data obtained from the study were subjected to Chi square to compare and test for relationship between the means using SPSS version16. Level of significant was accepted at $p < 0.05$. LH. The significant difference was indicated if p value was < 0.05

Results

Table 1 shows the frequency of malaria infection. The percent of infected people in 2020 were 97.8% while in 2012 were 2.2%. Of the total infected people 99.2% were male blood donors and only 0.8% were female donors. **Table 1: The frequency of malaria infection**

	Frequency	Percentage (%)
Year 2012	18	2.2
Year 2020	814	97.8
Total	832	100
Male	825	99.2
Female	7	0.8

Table 2 shows the prevalence of malaria infection in different age groups. The most infected donors by malaria disease were those in the age range 20 - 29 years old (39.1%) and the least infected donors were those of 18 - 19 years old (2.4%). Donors over 50 years showed an infection frequency of 3.2%.

1. Table 2: The prevalence of malaria infection in different age groups

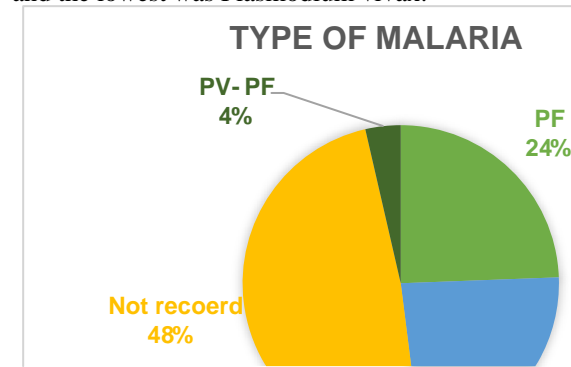
Age	Frequency	Percentage (%)
18 – 19	20	2.4
20 – 29	325	39.1
30 – 39	289	34.7
40 – 49	169	20.3
>50	27	3.2
Not recorded	2	0.2
Total	832	100.0

Table 3 shows the relationship between blood groups and the prevalence of malaria infection. About 50.5% of those having group O+ were malaria infected; whereas the least voluntary platoon is AB- (0.1%).

2. Table 3: Relationship between blood group and the prevalence of malaria parasites infection

Blood Group	Frequency	Percentage (%)
A+	232	27.9
A-	30	3.6
B+	79	9.5
B-	6	0.7
AB+	16	1.9
AB-	1	0.1
O+	419	50.4
O-	45	5.4
not recorded	4	0.5
Total	832	100.0

Figure 1 shows the prevalence and type of malaria. The most frequent type of malaria found was Plasmodium falciparum and the lowest was Plasmodium vivax.



3. Figure 1: Prevalence and type of malaria

XXV. DISCUSSION

The present study conducted among blood donors attending in the National Center for Blood Transfusion and Research with the objectives to determine the demographic characteristics of blood donors and the frequency of malaria parasites among the blood donors in

Sana'a city. Blood safety is a topic of continuing concern, and much effort is expended on measures to decrease the risk for transmission of infectious agents via transfusion. At the same time, emerging infections may threaten this safety. The risk for major transfusion transmissible infections continues to decline as a result of continually strengthening interventions and because of more general improvements in public health [4,8,9].

Our results showed a difference in the infection rate between the two selected points (the years 2012 and 2020) before and after the war. In 2020 the infected people were 814 with only 18 back in 2012, the reasons of this great contrast due to, the massive change in the climate, current war and conflict in Yemen. People also play a role in spreading malaria from endemic areas to Sana'a, where after war, many people displaced from their home because of the war and the conflict, this is could be the possible reason for the higher rate during the current conflict in Yemen. Lack of awareness of personal hygiene and sanitation services, poverty, climate change and an environment conducive to mosquito growth [4,10,11] have led to the spread of malaria such as lack of awareness. This study showed that male donors are more than female donors. Previous study has also showed that very small proportions of donors were females. Similarly, in India, a study showed the percentage of female donors to be even as low as 0.1% [12]. The low number of female donors in developing countries has been attributed to negative culture and wrong beliefs. The ratio of male to female blood donors was similar to the study conducted by Tagny et al [13] who reported 61% of donor population to be males in Togo. Our study also noted that people in the age group 20 to 29 years were highest donors because they enjoyed good health not suffering from a chronic disease and did not use any medication; while those older than 50 years were the lesser donors because of their overall health conditions.

Our results showed that the most Blood group are suspected for having Malaria is O+ because it is the most common blood group in Yemen, similar to that reported globally whereby O+ accounted for 38.66% while the AB- is 0.36% [14-17]. This finding is different from other those reported in previous studies reporting no relationship between ABO blood group and malaria [10,11,18]. However, recent studies support the view that blood group O provides a selective advantage against severe malaria. A recent case-control study carried out in India showed a significant association of blood group B, but not A and AB, with severe malaria [19,20].

In this study, the most prevalent malaria parasite specie found among the donors was *P. Falciparum*, which is the most dangerous of the four human malaria parasites and most effectively transmitted by *Anopheles gambiae*. *P. Falciparum* predominated because *Anopheles* is the most widespread and the most difficult to control of all vectors of malaria parasites, and because of the high degree of virulence of *P. Falciparum*

it is necessary to screen blood routinely for malaria parasites before transfusion [21].

XXVI. CONCLUSION

To sum up the study showed that the war played a significant role in increasing the number of people suffering from malaria and that the situation is worsening due to lack of awareness, migration and weak economic conditions. Raising people's awareness of the dangers of malaria is highly recommended, Blood donors should be routinely screened for malaria parasites, the collected blood samples should be properly labeled either negative or positive of malaria parasites.

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Knowledge, Attitude and Practices for Nutrition¹⁷ And WASH Among Care Givers Of Children Under 5 Years Old In Hajjah And Hodeidah Governorates, Yemen

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Abstract

Background: *Appropriate feeding is important in improving nutritional status & child survival. UNICEF reported that malnutrition due to food insecurity in Yemen is alarming (> 15%). The water situation in Yemen is in severe crisis and 50% of Yemen's population does not have access to safe drinking water or sanitation. The aim of this study was to identify knowledge, attitude and practices of caregivers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates, Yemen. Methods: This was a KAP study with two-stage cluster sampling using the nutrition survey model. The principal tool to understand or define previous and current KAP towards recommended nutrition and WASH practice followed nutrition survey model which was adopted from the UNICEF's guideline for assessing nutrition. KAP survey assesses both the short-term outcomes of social behavior change activities like a change in knowledge or attitudes but also the medium and long-term outcomes, such as a change in actual behavior and the resultant practices. Results: There is good knowledge on breastfeeding, and its initiation within one hour after birth; and the breast milk ideal food for 0-6 months aged child. However, benefits of breastfeeding on mother is absolutely unknown by 39.9%. Average duration of breastfeeding is 18.5 months; however, cease of breastfeeding among 42.1% mothers was due to lack of breast milk. Only 1 in 5 children received daily 4+ items of food which indicates low rate of minimum diet diversity. 44% of households are using unprotected wells as a main source for their domestic/drinking water needs. In addition, there is potential contamination of water during handling inside house that highlights importance of providing more training about water handling at household level. Open defecation is practiced by 57.9% of households, 53.6% dispose the wastes behind the house. Overall 38.46% of HHs have latrines. About half of women wash hands after using the toilet, 38.2% before cooking, 65.7% before eating and 35.5% before feeding the child. No hand-wash premises among almost all households. Conclusion: There is a positive return on good nutrition practice and WASH practices of DRC investment.*

Keywords: : KAP, Nutrition, WASH, Caregiver, Children under 5 years, Yemen.

XXVIII. INTRODUCTION

Disease and malnutrition are closely linked. Malnutrition is the largest single contributor to disease in the world, according to the UN's Standing Committee on Nutrition (SCN). Malnutrition is an underlying cause of death of 2.6 million children each year – a third of child deaths globally [1]. A malnourished person finds that their body has difficulty doing normal functions such as growing and resisting disease. Physical work becomes problematic and even learning abilities can be diminished. Malnutrition at an early age leads to reduced physical and mental development during childhood. Iodine deficiency is the world's greatest single cause of mental retardation and brain damage. Under nutrition causes women give birth to low birth-weight babies [2]. 1 in 4 of the world's children are stunted [3]; in developing countries this is as high as one in three [4]. This means their bodies fail to develop fully as a result of malnutrition. Under nutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and contributes to delayed recovery. Poor nutrition in the first 1,000 days of a child's life can also lead to stunted growth, which is irreversible and associated with impairment [5].

Nutritionally-related health patterns in the Middle East have changed significantly during the last two decades. Within these changes, the Middle East has the highest dietary energy surplus of the developing countries. The population in the region has low poverty prevalence, at 4%. The region's child malnutrition rate is 19%, suggesting that nutrition insecurity remains a problem due to mainly poor health care and not due to inadequate dietary energy supply or poverty. In the Middle East, as in other parts of the world, large shifts have occurred in dietary and physical activity patterns. These changes are reflected in nutritional and health outcomes [6]. More than half a million children are facing life-threatening malnutrition in Yemen where the humanitarian crisis is worsening and the stunting rates in Yemen are likely to go up. It means children do not reach their full height but also that their cognitive capacities are affected, which becomes a permanent burden on the whole society. The United Nations has designated Yemen as one of its highest-level

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humanitarian crises with 80% of the population on the brink of famine. Aid deliveries have been severely restricted, compounding the crisis from four years of war that have left 10 million children in need of urgent relief [7].

Safe drinking water, sanitation and hygiene (WASH) are critical to people's health and well-being, especially to maternal, newborn and child health. Almost 10% of the global burden of disease is attributable to unsafe WASH and women and children are most affected by the consequences of poor access to these services. Cholera and watery diarrhea disease, resulting from contaminated food and water sources, is a leading cause of child mortality and morbidity, and diarrhoea is a major cause of malnutrition. Treatment alone will not break the cycle of transmission; improvements of WASH infrastructure and appropriate health-seeking behavior are essential to achieving sustained control, elimination, or eradication of many water borne diseases.

The aim of study was to identify knowledge, attitude and practices of care givers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates, Yemen.

XXIX. MATERIALS AND METHODS

KAP study was administered to identify knowledge, attitude and practices of care givers toward nutrition and WASH of their children under 5 years old in Hajjah and Hodeidah governorates. Six districts were targeted in the present study as had been identified by UNICEF as priority districts for funding based on their needs further analysis relating to both WASH and Nutrition. The districts include: Aslem, Mustaba and Bani Qais in Hajjah governorate and Al Garrahi, Al Munirah and Azzuhrah in Hodeidah governorate. The survey use two-stage cluster sampling and villages are considered as the smallest geographical unit (cluster). The survey covered women who have at least one child under 5 years old.

Informed consent was obtained from the study participants after explaining the purpose of the study. Participation of all respondents in the assessment was on voluntary basis and respect, dignity, confidentiality, and freedom of each assessment participant was maintained during and after the survey.

For child care givers under 5 years old the sample size of households was drawn using the nutrition survey cluster sampling (30/13). Each cluster should include 30 eligible households. Number of clusters at each of the 6 districts was determined proportionately with population size. Therefore, through a simple random sampling obtained one cluster of 30 households for each 10,000 or less population. This procedure allowed to having 13 clusters representing the 6 districts population. The sample size calculated was 416 of child care givers.

For school surveys: Elementary schools, 4 classes from the 2nd- 6th grades were selected randomly from each school. While for elementary and intermediary schools, 4 classes selected so that one class among the 7th to 9th grades and three classes from the 2nd to 6th grades. In schools include all levels (elementary, intermediate and secondary), one class

from 1st,2nd and 3rd grades of the secondary level; one class from the upper three grades of the intermediate level and 2 classes from the 2nd-6th grades of the primary level were randomly selected. Samples of students to be interviewed were selected by dividing the number of class students by 10. In the class, the enumerators chose the first student whose order in the list fit with result of the division mentioned. All teachers of chosen classes in addition to social workers and school managers were also interviewed with students of the selected class. By this way, a total of 539 students and 74 teachers participated to the survey.

The questionnaire was administered to selected students, their teachers, social workers and school managers who all were gathered into one of school classes where they answer the questionnaire. The data collection tools include structured questionnaire relevant to KAP for the four main targeted groups including: child caregivers at household; teachers and students at schools, health care workers at health facilities; and community leaders at community level. The targeted four groups surveyed are strongly related to the existent WASH, nutrition and health integrated program that intends to alleviate the acute malnutrition among under 5 years children in targeted districts and communities known to be amongst the most affected areas with malnutrition in the country.

Appropriate questionnaires for each category were developed, translated, pre-tested and approved by Danish Refugee Council in Yemen before being used in the field.

The principal tool to understand or define previous and current KAP towards recommended nutrition and WASH practice followed nutrition survey model which adopted from the UNICEF's guideline for assessing nutrition [8]. KAP survey assesses both the short-term outcomes of social behavior change activities like a change in knowledge or attitudes but also the medium and long-term outcomes, such as a change in actual behavior and the resultant practices.

Household questionnaire adopted from UNICEF manual for assessing nutrition-related KAP and WASH cluster guideline, were used to collect quantitative data from mothers/caregivers of children under 5 years old. The HH questionnaire had three modules; child feeding section (0-5 years), personal hygiene and WASH and Nutrition. Each module starts by asking knowledge related questions followed by attitude and lastly practice related ones. This ensures that the information collected was consistent and that the interviewer was in good position to track any discrepancies while filling out household interview. The household questionnaire asks KAP questions on breastfeeding, complementary feeding, under-nutrition, WASH and questions related to pregnant and locating mothers feeding practice.

The community leaders survey were used to determine WASH (water situation, sewage system and solid waste management) and economic situation including livelihood, employment, income generating activities of HHs, affordability to seek health services by all people and nutritional support to malnourished women and children. School survey questionnaire had mainly two modules; School WASH (school

water supply, storage and use, sanitation and solid waste management and food and body hygiene), and diseases recognition and protection measures knowledge with teacher define their roles. The health workers survey test questions include malnutrition diagnosis, case management both at clinic and at community level program.

The surveys were conducted from February to March 2014. Each enumeration area (cluster) was selected using a random systematic sampling (walking method) by enumerators. Household eligibility for inclusion in survey is that a woman should have at least one child under 5 years old. Field workers started from one defined health facility and one school geographical points. Accordingly, the fieldworkers in each locality then selected 18 households from zone area of each health facility and 12 households from zone area of each school. For selection of households, enumerators started with the first household located in front of the facility and thereafter walk in an o'clock wise direction.

XXX. STATISTICAL ANALYSIS

The survey data was entered in Excel program for cleaning at Danish Refuge office at Sana'a. The cleaned data then transferred to SPSS program (version 20) for statistical analysis. The entries for the variables for all the questionnaires were re-checked and cleaned again. All data entries from these questionnaires were compared with the data on the physical/hard copy of the questionnaires. The differences in the two governorates were statistically compared using Phi and Cramer's V Statistics (for categorical variables) and Analysis of Variance (ANOVA) (for the numerical variables) where the numbers of counts not less than 20%. P-values of less than 0.05 depicted significant statistical difference of the estimates by background characteristics. The survey covered women who have at least one child under 5 years old.

XXXI. RESULTS

XXXII. DEMOGRAPHIC CHARACTERISTICS OF WOMEN

Data collected included 416 households, 539 students 74 teachers, 52 health workers and 26 community leaders. The overall response rate was 99.52%. Hajjah was represented by 61.6% of the HHS survey. Moreover, 75% of the sample size in Hajjah was chosen from Aslam district. Age structure of women interviewed showed that 45% of women were of the middle age group (25-34), with a mean age of 30.1 years (Table 1). All women interviewed were married (99.03%) and 6 were divorced. The majority of women (57.9%) had 1-5 live children while 2.7% of the women had 11 children or more. women with 5-10 children (40%) indicated persistence of traditional fertility pattern. Differences between the 2 governorates in terms of number of live children are minimal.

Table 1: Distribution of women interviewed by governorate and district (n=414)

Governorate	District	Planned	Interviewed	%
Hajjah	Aslam	192	192	46.4
	Bani Qais	32	31	7.5
	Mustaba	32	32	7.7
	Total	256	255	61.6
Hodeidah	Al Munirah	64	64	15.4
	Al Garrahi	31	31	7.7
	AzZuhrah	64	64	15.4
	Total	159	159	38.4
Total		414	414	100

XXXIII.

XXXIV. KNOWLEDGE OF INFANT AND YOUNG CHILDREN FEEDING

Exclusive breastfeeding: 73.7% of women from Hajjah have been advised for exclusive breast feeding by their mothers; whereas 41.2% of mothers in Hodeidah were advised by health centers for exclusive breastfeeding. 48.1% of women reported that non-human milk is the best food to be given to the child of 0-6 months. Knowledge on starting breastfeeding: immediately or within one hour after birth was confirmed by 75.85 % of mothers. Only 18.6% of women were aware that breast milk is the right food for the child of 0-6 month's age and 19.8% knows that breast milk protects child from diseases. Benefits of breastfeeding on mothers: Almost 40% of women did not know any benefit of breastfeeding while only 1.2% women know that breastfeeding prevent pregnancy. Almost half or less of interviewed mothers were aware of benefits of breastfeeding including a bond between baby and mother, reduce breast cancer, and prevent pregnancy etc. (Table 2).

Table 2: Breastfeeding benefit on mothers (n=414)

BF Benefits on mothers	Hajjah (n=255)		Hodeidah (n=159)		Total	
	F	%	F	%	F	%
Creates a bond between baby and mother	78	18.8	64	15.5	142	34.3
Prevents mother from getting breast cancer in the future	34	8.2	16	3.9	50	12.1
It is free	33	8.0	10	2.4	43	10.4
Breast milk is ready to use	26	6.3	4	1.0	30	7.2

Babies who are breastfed will need less medical care	1	0.2	5	1.2	15	3.6
Attention as they are sick less often	52	12.6	15	3.6	67	16.2
Prevents pregnancy	3	0.7	2	0.5	5	1.2
Don't Know	100	24.2	65	15.7	165	39.9
Total	255	61.6	159	38.4	414	100.0

Table 3 shows the average number of food items given to the child in the past day in both governorates. About 80.15% of mothers were given 1-3 items while 19.86% were given ≥ 4 items.

Table 3: Average number of food items given to the child in the past day

Number of Items given	Hajjah		Hodeidah		Total	
	F	%	F	%	F	%
1-3 items	206	80.78	125	79.11	331	80.15
≥ 4 items	49	19.04	33	21.9	82	19.86
Total	255	100	158	100	413	100

The children weight loss during the complementary food phase had been noticed by 42% of mothers, only 33.1% sought advice at health care service. A total of 35.5% mothers provided the child higher quantity of food than usual to regain the weight lost; while 16.9% did nothing about the weight lost (Table 4).

What has been done	Hajjah (n=116)		Hodeidah (n= 50)		Total	
	F	%	F	%	F	%
Went to health center	33	19.9	22	13.3	55	33.1
Asked family member for advice	3	1.8	0	0.0	3	1.8
Gave the baby more food	43	25.9	16	9.6	59	35.5
Changed the diet of the baby	8	4.8	4	2.4	12	7.2
Went to midwife/health worker	4	2.4	2	1.2	6	3.6
Went to see the traditional healer	2	1.2	1	0.6	3	1.8
Did nothing	23	13.9	5	3.0	28	16.9
Total	116	69.9	50	30.1	166	100.0

Table 4: Measures taken by mother when the child has lost weight when weaned (n=166)

Practices and attitude of infant and young child feeding 57.2% of women-initiated breastfeeding immediately or within one hour after birth, while 20% within first hour after birth (8.5% in the first day and 12% within the second day) (Table 5).

Table 5: First time women put the child to the breast by governorate (n=414)

Statements	Hajjah (n=255)		Hodeidah (n=159)		Total	
	F	%	F	%	F	%
Immediately	14	33.0	9	23.4	23	57.2
Within first hour after birth	0	8.0	7	8.5	7	2.0
Within first day	48	11.6	3	2.9	35	8.5
Within second day	6	9.4	9	2.2	48	11.6
Don't know			1.4	11.0	2.7	
Total			38.4	41.4	100.0	

XXXV. INFORMATION ON BREASTFEEDING

For 88.33% of women, the knowledge on breast feeding originated from close relatives to the child, such as mothers (44.6%), mothers in law (8.7%), sisters (8.1%), aunts (15%) and grandmothers (7.2%); while 16.2% of women received information on breastfeeding from health care midwife. Three out of four women believe that the best time to initiate breast feeding is immediately/within 1hr after birth and only 16.67% of women know that duration of exclusive breast feeding is 6 months. Nearly half of women (48.1%) consider the breast milk is ideal food for 0-6 months aged child while 91% of women reported that breastfeeding on demand is enough despite that the benefits of breastfeeding on mother is absolutely unknown by 39.9% of mothers. In terms of breastfeeding duration, about 43.16% of women breastfeed their children for 24 months (Table 6).

Table 6: Breastfeeding duration by child age (n=95)

Breastfeeding duration (months)	Hajjah (n= 66)		Hodeidah (n=29)		Total	
	F	%	F	%	F	%

Less than 24 months	37	38.9	12	12.6	49	51.6
24 months	26	27.4	15	15.8	41	43.2
≥ months	3	3.2	2	2.1	5	5.3
Total	66	69.5	29	30.5	95	100.0

Almost 93.7% of women believed that 6+ months is the appropriate age to complementary food for a child. Only 1 in 5 children received daily 4+ items of food. One in three women feed the child of 6+ months age in accordance with recommended minimum meal frequency (4 times/24 hours). About 38% of women introduced the complementary food to the child earlier than the WHO recommended age of 6-8 months. The most common reason given for stopping breastfeeding was insufficiency of breast milk in 42.1% of mothers, followed by new pregnancy occurrence in 38.9% of women.

XXXVI. WATER, SANITATION AND HYGIENE

Water supply: The current households survey shows that the main source of domestic and drinking water is unprotected well (42.6%), followed by piped water supply (24.7%) and only (15.8%) getting their drinking water from protected sources (Table 7). Community leaders in both governments reported that the main source of water in the areas is surface water in 50.0%.

Table 7: Distribution of main source of drinking water (n=416)

Main source of drinking water	Hajjah (n=256)		Hodeidah (n=160)		Total	
	F	%	F	%	F	%
Piped water	50	12.0	53	12.7	103	24.8
Tanker	4	1.0	13	3.1	17	4.1
Public	0	0.0	1	0.2	1	0.2
Tube well	1	0.2	22	5.3	23	5.5
Protected	18	4.3	48	11.5	66	15.9
Unprotected	154	37.0	23	5.5	177	42.5
Valley	29	7.0	0	0.0	29	7.0
Total	256	61.5	160	38.5	416	100.0

Sanitation: Defecation in the open was practiced by 57.93% of house-holds, with 38.5% having latrines. Most latrines (92.57%) were located inside the house-holds and are used by the vast majority (94.86%) of family members (Table 6). Improved ventilated latrine was available for 25% of house-holds.

Type of latrine	Hajjah (n=256)		Hodeidah (n=160)		Total	
	F	%	F	%	F	%
Pour flush latrine to piped sewer system or Septic tank	1	0.2	1	0.2	2	0.5
Ventilated Improved pit (VIP) latrine	42	10.1	62	14.9	104	25.0
Traditional toilet (a simple hole)	32	7.7	24	5.8	56	13.5
Mobile toilet (bowl or bucket)	1	0.2	2	0.5	3	0.7
Public toilet	3	0.7	7	1.7	10	2.4
In the open	177	42.5	64	15.4	241	57.9
Total	256	61.5	160	38.5	416	100.0

Table 8: Type of latrine used (n=416)

Hygiene: Hand washing with water and soap rate differs with each of the most critical moments. About 50.5% of women wash hands after using the toilet, 38.2% before cooking, 65.7% before eating and 35.5% before feeding the child. Hand washing premises were lacking among all house-holds (99.76%). Over half of households (53.6%) dispose their solid wastes behind the house. Women who drink boiled water counted for 46%, while 35% do not know what to do to prevent diseases; with only 23% cover and protect drinking water.

Figure 1 indicates the overall scores obtained by respondents by governorate. The health care workers who choose the right answer were only 21 (40%).

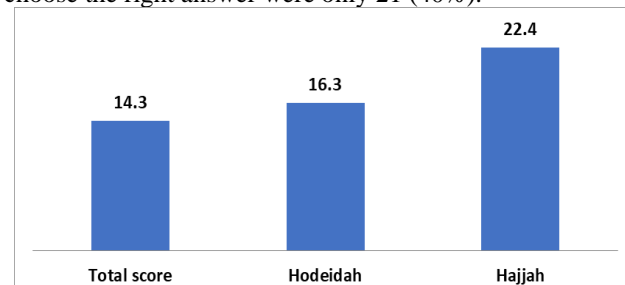


Figure 1: Health workers final scores by governorate

A. Discussion

The educational level of women interviewed was very low with 79.47% being illiterate. Illiteracy at this level is higher than the national rate of rural women illiteracy (62.2%) [9]. Occupational status of women interviewed was poor where 94% were housewives and only 4.1% were handcrafts women. Despite high percentage of Yemeni women were advised to breastfeed, only 16.9% know the recommended duration of 6

months for exclusive breastfeeding. Results of this study show that mothers have much lower knowledge and negative attitude towards exclusive breastfeeding than similar study conducted in Egyptian mothers, who all agreed that breastfeeding is the best nutritional source for infant 0-6 [10]. These unsatisfying results are due to the fact that most of Yemeni mothers lack access to information's of recommend infant feeding guidelines and a cumulative traditional miss concept. Women, who did not have access to correct information, consequently lacked knowledge which contributed to the increasing rates of malnutrition in the region [10]. The minimum diet diversity indicator depends on 7 food items, out of which any 4 of them will ensure protein/fat and energy needs of children aged 6-23 months [11].

Benefits of breastfeeding on mothers are far from being captured. Almost 40% of women do not know any benefit of breastfeeding while only 1.2% knows that breastfeeding prevent pregnancy. This figure is far below the 31% of reported women in Ethiopia who were aware that breastfeeding prevent pregnancy [12]. The gap is probably the result of lack of women's rights to know the different contraceptive methods; including Lactation-AmenorrheaPeriod (LAMP method) which might have been neglected by the reproductive health service providers which failed to cover all mothers in the country and ignorant of mothers about family planning programs. Poverty also keeps many mothers away from reaching the available few family planning services.

There is low knowledge about diet diversity with only 19.86% of children received 4 food items during the past day instead of the minimum diet diversity indicator which depend on 7 food items and thus indicate poor dietary profile for 4 out of 5 children. The minimum diet diversity percentage is less than that reported previously as 29% by the NHS-1012 in Hodeidah [13]. This survey found that almost half of Yemeni children lost their weight during the complementary food phase most probably due to poverty level. This pushed Yemeni mother to make a standard tinny formula, which lasts for 4 days to be used for up to two weeks through diluting the product, so it fails to nourish the child. This is simply because families do not afford to buy the product regularly and/or putting family in extreme situation to do so [13].

Most of women (77.2%) initiate breastfeeding immediately or within one hour after birth, and thus had initiated the breast feeding appropriately according to WHO & UNICEF recommended time. This percentage is similar to that obtained in studies in India (70.29%) [14] and 72.7% in western Nepal [15]. About 43.16% of women breastfeed for 24 month that is comparable to findings from other studies in America. On the other hand, up to 12 months was high among the respondents (73%) in Southwest Nigeria [16]. In our country, mothers continue breast feeding for longer duration most probably due to religious reasons as Quran promote breast feeding for successful two years [17]. In this survey, exclusive breastfeeding rate of children 0-5 months was 13.5%, which is almost similar to an American study whereby only 13% of

mothers were still exclusively breastfeeding when their infants reach 6 months, equals the length of time recommended by the WHO and the AAP [18]. However, much lower than a similar study in Accra, Ghana [19].

Almost 38% of women introduce the complementary food to the child earlier than the WHO recommended age of 6-8 months. These results indicate lower percentage than those previously reported in rural areas in Yemen as 75% [20]. The most common reason given for stopping breastfeeding was insufficiency of breast milk in 42.1% of mothers, similar to studies carried out in Saudi Arabia 43% [21]. This could be due to sub-optimal breast feeding practices including infrequent feedings, short duration of feedings, feeding from only one breast, and missing nocturnal breastfeeding's [22]. Other cause could be insufficient care giver knowledge on the recommended breast feeding length rime and how to sustain breast feeding.

Mothers often made the decision that their breast milk was insufficient because their baby cried after nursing or other family members advised them that their baby needed additional food [23]. The effect of these factors is likely to be the reason that 58% of the participants shifted to complementary food and Yemeni children still could not reach the standard breastfeeding time recommended by WHO. When mothers feel that child loses weight, 37.6% of them increase food quantity, 35% seek health assistance while 17.8% of women do nothing. When child get sick, 68.12% of children drink more than usual quantity of liquids, while 97.82% eat less than usual quantity of food which dispose them at nutrition & health risks such as under nutrition. Advice on quality and quantity of food given to the child needs originates from mother experience and knowledge in 44.4%, and from women group (23.9%) and mothers in law (19.1%). Some 16.2% do not know their source of information.

The study revealed that 46.5% of population obtains water from unimproved water sources and 70% did not know how to treat water for safe consumption [24]. While the world has met the Millennium Development Goal target for access to improved drinking water, Yemen is one of the few off-track countries and was not able to meet its target by 2015 [25]. With only 24.8% of surveyed households have connection to water network; women, girls and boys are burdened with water fetching from sources. A trip to fetch water takes 30-60 minutes in 45.39% of house-holds, and 60 minutes or more in 12.29%. This indicates that the time spent to fetch water by about 57.67% of households is above the international Sphere standards of 30 minutes or less walk distance. It has been noticed that water quality in the households is often contaminated due to inappropriate water storage at the household level, leading to contamination of otherwise clean water. A divergent situation was found regarding the unprotected and unsafe sources of drinking water [26]. Water supply in Yemen is characterized by many challenges include:

severe water scarcity, high level of poverty, making it difficult to recover the costs of service provision; limited capacity of sector institutions to plan, build, operate and maintain infrastructure; and the security situation makes it even more difficult to improve or even maintain existing levels of service. These figures in agreement with a recent study carried out by WASH cluster on WASH needs assessment in 28 districts of Hajjah, Amran, Al Hodeida, and Raymah governorates which found that 69.7% of the surveyed population don't have sufficient water supply. Similarly to current study, that Almost 1 in 4 households store water in plastic bucket. Pouring was used to collect water from the storage to the point of use by 73.3% households.

Furthermore, some studies suggest heterogeneous effects of improved water supply and complementarities between health and education. For instance, Jalan and Ravallion [27] found that piped water has no significant impact on diarrhoea among the poorest groups which they explain by a lack of education. Study by Alderwish and Dottridge [28] indicates that contamination occurs due to the need for households to store water in the house instead of using tap water directly. This need arises from the shortage of supply, inadequate quantity supplied or expense [29].

Sanitation is almost absent but for some CLs it's still substandard. As well known in UN, for decades, sanitation was considered to be as poor as water. About 20 million people are now in need of water and sanitation, increased by 52% since before the Saudi Arabian-led intervention in Yemen started, and the price of water has increased so much that some families spend a third of their income on water. Yemenis have resorted to collecting water in buckets when it rains. The situation has led to the spread of disease, including dengue and malaria. While 35% of women do not know what to do to prevent diseases, just 23% cover and protect drinking water. The above figures may explain reasons of the diarrhea high prevalence rates.

XXXVII. CONCLUSION

Recommended practice for good nutrition such as exclusive breastfeeding, continued breastfeeding, diversity score were relatively stronger and better among mothers living in Hodeidah than Hajjah, even though the difference between the two were not statistically significant. Furthermore, knowledge on importance of exclusive breastfeeding among mothers, actual practice and knowledge on importance of breastfeeding averaged until a child reaches 18.5 months. Benefits of breastfeeding on mother are absolutely unknown. Knowledge, attitude and practice on WASH related recommended behaviors were negative in mothers in both governorates. In addition, clear lack of WASH hardware is evidenced. Therefore, there is room for improvement in both soft and hardware component in these areas so it can be effective enough to change the KAP of targeted population of Hajjah and Hodeidah governorates. **Competing interests** None declared.

XXXVIII. REFERENCES

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