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Ethnopharmacological survey of medicinal plants used by patients with gastrointestinal tract disorders in the northern region of Palestine

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Abstract

There are many medicinal applications of natural plant remedies. Several illnesses are still being treated by Palestinian people using medicinal plants. This research was intended to study the use of natural plants to treat different types of gastrointestinal tract disorders (GITD). In the Northern part of Palestine (Jenin, Tulkarm, Qalqilia, and Nablus), an ethno-pharmacological study of medicinal plants used to treat GITD has been carried out. A questionnaire was circulated to 120 informants. The details gathered included the names of the plants, the parts used, the diseases for which the products were used, as well as the method of preparation. To evaluate results: UV (used value), Fic (factor of informant consensus), and FL (fidelity level) was calculated. This study showed that 40 plant species of 16 families were used for GITD. Labiatae (10 species) and Umbelliferae (8 species) were the most prevalent plant families. The pieces used most commonly were leaves and seeds. Decoction was the technique of preparation and was taken as a hot drink. Abdominal flatulence (0.88) was the highest Fic value, followed by constipation (0.80). The maximum FLS were reported for *Cucumissativus* (100) and *Prunusamygdalus* (100) for heart burn, *Solanum tuberosum* (100) for vomiting and diarrhea, *Ficuscarica* (100) as laxatives. The information provided on medicinal plants, with maximum UV & FL values can serve as basic data for further research to identify the active biological ingredients in these plants, and thereafter, to develop new drug preparations for the treatment of disorders of the digestive system.

Keywords: Ethnopharmacology, Herbal plant, decoction, gastrointestinal disorders.

INTRODUCTION

The main cause of morbidity in developing countries is gastrointestinal disorders “A new classification of functional gastrointestinal disorders (FGID) became available recently, based on consensus in expert committees (‘Rome III process’)” [1].

A study conducted in the US found that at least 1 FGID qualified for 23.1 %of children and adolescents in the US [2]. These findings indicate that gastrointestinal diseases rely on the community's social climate, access to water and food protection, malnutrition [3] , type of food eaten, and disjunctively of the food constitution [4], Bacterial, fungal and parasitic agents causing Diarrhoea, stomach ache and gastric atrophy, depends on: rotavirus, Helicobacter pylori, Shigella, Escherichia coli and Salmonella. [4] Vibrio cholerae, Aeromonas, [5]. Stress also directly provokes intestinal dysmotility and heightens hypersensitivity [6].

Although the pathophysiology of these disorders remains not fully understood, they result from a complex interaction between biological, psychological, and social factors that can be predisposing, precipitating, and/or perpetuating [7].

Using medicinal plants for the treatment of (GITD) is a common practice among indigenous communities. It is estimated that about 34 % of medicinal plants are used to treat GITD [8]. Medicinal products isolated from medicinal plants or artificially modified forms of natural products are healthy, environmentally friendly, and regularly recommended by doctors[9].

It has been recognized for the past 20 years that in some developing countries, plants are the main medicinal sources used for the treatment of infectious diseases, such as Asia [8] and Africa [10]. Ethnobotanical surveys and literature reviews have shown that Guatemala uses 385 plants from 95 families to treat gastrointestinal disorders, the crude extracts of 26 medicinal plants exhibited antibacterial activity [11].

The effectiveness of many medicinal plants for treating gastrointestinal disorders has been verified by clinical studies [12, 13], even though their consumption habits vary from culture to culture.

Palestine, as a holy land characterized by great ethnic variability, thus creates great biological multiversity. Such variability, particularly in tradition, herbal foods and medicine, has enriched its culture [14].

More than 2600 plant species cover the hills and mountains of Palestine and the Golan Heights, of which more than 700 are known to be used as medicinal herbs or as botanical pesticides [15-17]. Furthermore, about 30% of the flora in Palestine are considered rare and many of them are endangered. A recent ethnopharmacological survey of 120 informants living in Palestine found that at least 63 reliable plant species are still in use for the treatment of skin, urinary system, gastric system, prostate disease, cancer and other diseases [18].

The present study aimed at documenting the traditional uses of medicinal plants used to treat different gastrointestinal tract disorders in Palestine and to evaluate the efficacy of plant species based on the review of literature.

METHODS

The present study was performed at outpatient clinics in the northern regions of Palestine (Jenin, Tulkarm, Qalqilia, and Nablus) in a cross-sectional observational design during the period from August to November 2018. (Fig 1)

Figure (1): Map of west bank / Palestine (Taken from Internet ARIJ).

The research was conducted in an interview with herbalists, traditional healers, and herbal medicine practitioners. The inclusion criteria were Palestinian adults residing in the northern part of Palestine and agreed to join the study without any informed consent, the random participants were given complete information about the aim of the study, the participation was completely voluntary without any monetary or nonmonetary incentives, and their identity was kept anonymous. The collected data was used only in this study.

Structure, interview and validation of the questionnaire

The questionnaire was developed based on through literature review pertaining to herbal use in digestive tract diseases from different communities, in addition the studies that reported medicinal plants used among Palestinians were also reviewed.

The new design questionnaire consisted of two parts; a copy was attached. The first part provides information about patients: educational status, marital status, age, monthly household income, accommodation, form of treatment. These are listed in Table (1). In the second section, patients answered open-ended questions regarding the name of the medicinal plants used, the explanations for

the usage of these medicinal plants, and the infographics, preparation methods, and sources of these plants. The random sample procedure was used to recruit 120 participants using Cochran's (1963) equation for prevalence studies. Sample size = n = (Z $\alpha/2)^2$ p (1 – p)/ $\Delta 2$, Δ Assumed to be 10 %. Considering the 10% drop out, the required sample size was 115 participants, then the number was rounded to 120 participants.

Data analysis

The Statistical Package for Social Sciences (SPSSversion17.0) was used to perform

Statistical analyses. The factor of informant's consensus (Fic) was employed to indicate the homogeneity of the information. In fact, its main use is to select the disease categories where there is consensus on the use of plants among the informants. The Fic value is close to 0 if plants are randomly choosed or if informants do not exchange information about their use. High values of fic (close to 1) occur when there is a well-defined selection criterion in the community and/or if information is frequently exchanged between informants [19]. The Fic is calculated as in the following equation:

$$\text{Fic} = \frac{Nur - Nt}{Nur - 1}$$

Where Nur is the number of citations in each category and Nt is the number of taxa used.

Fidelity level (FL) was defined as the ratio between the number of informants who independently suggested the use of a species for the same major purpose and the total number of informants who mentioned the plant for any use. FL is of equal importance to Fic and it can be calculated according to the following equation:[20, 21]

$$\text{FL \%} = \frac{Np}{N} \text{ X } 100$$

Where Np is the number of informants that reported the use of a plant species to treat a particular disease and N is the number of informants that used the plant as a medicine to treat any given disease.

The use value (UV) is a quantitative method that can be used to prove the relative importance of species known locally. It can be calculated according to the following equation: [20]

$$\text{UV} = \frac{\sum U}{N}$$

Where UV is the use value of a species; U is the number of citations per species; N is the number of informants. Results of calculated UV, FL, and Fic are shown in Tables 2, 3, 4.

RESULTS

Table 1 summarises the socio-demographic characteristics of our sample of 120 people included in the study. Respondents from all age groups but mostly (30.8%) were 16 – 29 years of age. They are from various educational backgrounds with most (64.2%) being from university-educated backgrounds, While the minority (3.3%), were from an elementary level of education or illiterate. We also sampled across income (64.2% were of medium income) and marital status (68.3% married, 30% single, and 1.7% were divorced or widowed). Place of residence: (63.3%) in a village while (2.5%) in a refugee camp. (37.5%) of the sample was housewives. Knowledge of natural products was also investigated; most of them obtained their information from relatives and friends (47.5%), herbalists (11.7%), and the internet (13.3%). Most (54.2%) obtained the natural products they used from herbalists ("Attarine"), and 21.7% from the wild.

Table (1): socio-demographic characteristics of the study population (N= 120).

Variable	**N (%)**
Age (year)	
16 – 20	37 (30.8)
30 – 39	16 (13.3)
40 – 49	31 (25.8)
50 – 59	28 (23.3)

Variable	N (%)
≥ 60	8 (6.7)
Education	
Illiterate level	4 (3.3)
Elementary or preparatory level	13 (10.8)
Secondary level	26 (21.7)
University level	77 (64.2)
Income	
Low	31(25.8)
Medium	77 (64.2)
High	10 (8.3)
Material status	
Single	36 (30)
Married	82 (68.3)
Others (divorced or widow)	2 (1.7)
Place of residence	
City	41 (34.2)
Village	76 (63.3)
Refugee camp	3 (2.5)
Job	
House wife	54 (37.5)
Employee	39 (32.5)
Worker	6 (5)
Dealer	4 (3.3)
Unemployed	26 (21.7)
Knowledge of natural products	
Media (TV, radio, journal, etc)	23 (19.2)
Relatives & friends	57 (47.5)
Herbalists	14 (11.7)
Pharmacy	1 (8)
Internet	16 (13.3)
Other sources	5 (4.2)
How can you have herbals	
Herbalists	65 (54.2)
Pharmacy	23 (19.2)
Friends	6 (5)
Wild	26 (21.7)

Phytodiversity of plants

The main reasons for the existence of rich traditional medicines are the cultural diversity and rich flora [22].

The present study reported 40 plants belonging to 16 families commonly used to cure various digestive diseases by the local community. Fig 2 shows that the largest families of gastrointestinal plants were Labiatae and Umbelliferae (10 species and 8 species respectively), with three species of Compositae, Zingiberaceae and Leguminaceae. Only 1–2 species were reported for the 11 remaining families. However, the calculated UV values for the Salvia *officinalis* plant that belongs to the Labiateae family are the highest with 0.275, *Cucumissativus* plants belonging to the Cucurbitaceae family have the second highest UV value of 0.233 for treating heart

burns, *Cuminumcyminum* belong to Umbelliferae has the same UV value for abdominal flatulence.

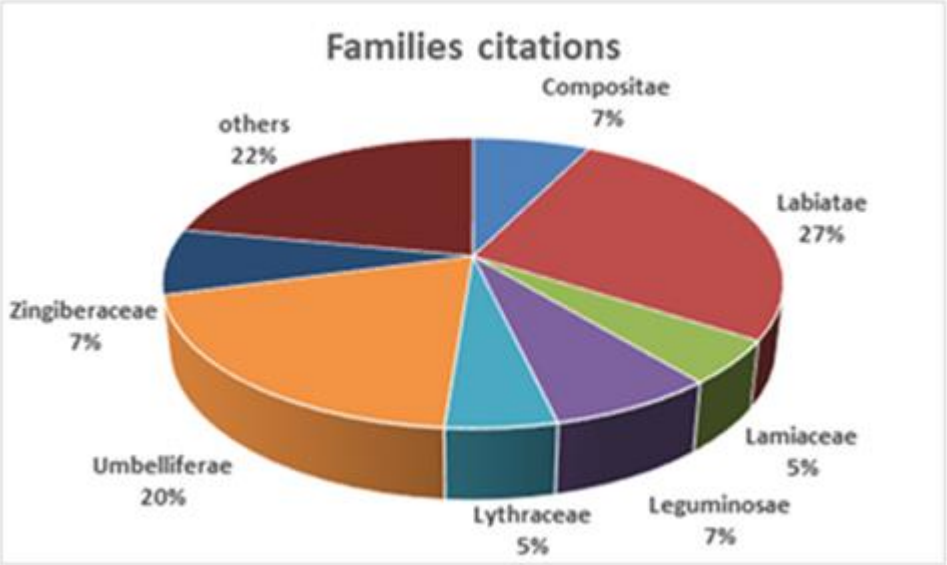

Figure (2): families citations of GI disorders.

All parts of different plants are used in the traditional remedies for various gastrointestinal disorders. However, the most frequently used parts are leaves with 41% followed by seeds with 36% percent. (Fig 3) shows the result of analysis on medicinal plant parts used to treat gastrointestinal disorders.

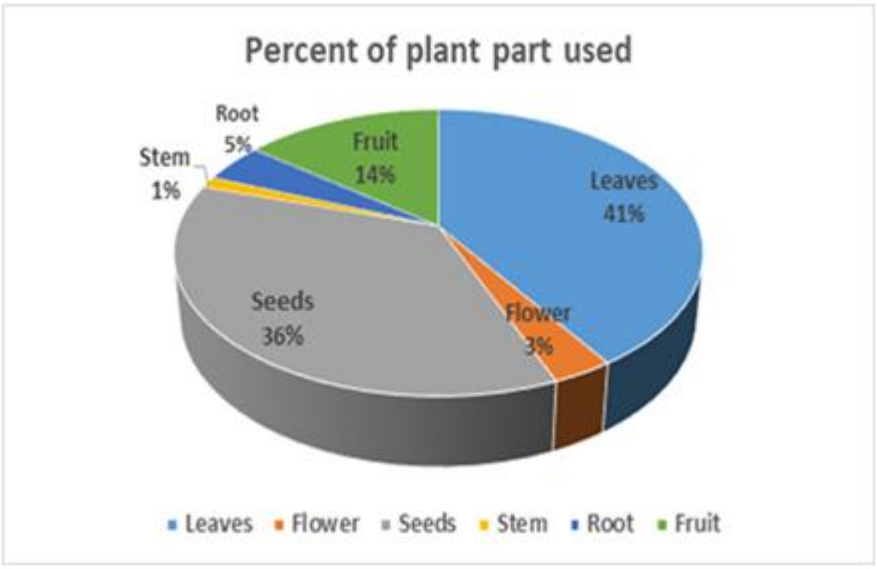

Figure (3): Percent of plant part used for GI disorders.

In this study, most herbal remedies were found to be prepared by decoction and administered mainly orally, which agreed with other studies concerning neighbouring areas, where it was seen that decoction is the method mostly used for the preparation of folk medicine [23, 24]. In most cases, people use other ingredients such as sugar and honey to prepare remedies. Some plants are also used as food-vegetable plants (such as *Cucumis sativus, Prunus amygdalus, Petroselinum crispum, Ficus arica*, and *Punica granatum)* that are eaten raw.

Traditional treatment of gastrointestinal disorders using plant extracts

Finally, it was seen that gastrointestinal system ailments, for which the folk medicinal

plants were mostly used, were as follows: heart burn, indigestion, vomiting and diarrhoea, constipation, abdominal flatulence and irritable bowel syndrome. Informant consensus of medicinal plant usage resulted in informant consensus factor (Fic) values between 0.71 and 0.88 per gastrointestinal disorder category. The category that had the highest Fic value was abdominal flatulence (0.88) followed by constipation (0.80). The lowest was indigestion (0.71) (Table 4).

It could be concluded that the plants with high fic values will be transferred more and therefore could be utilised much better in the treatment of certain illnesses [25] . The average fic value for all gastrointestinal disorder categories was 0.77, indicating a fairly high level of informant consensus compared with similar studies [26] .

Table (2): Plants used in the treatment of gastrointestinal disorders in Palestine.

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
Teucrium capitatum	Lamiaceae	Acidness	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, cool then drink a cup after meal	Decoction	2	.017
Cucumis sativus	Cucurbitaceae	Acidness	Fruit/ eat raw	Eat raw	28	0.233
Punica granatum	Lythraceae	Acidness	Fruit/ eat raw	Eat raw	2	.017
Ocimum basilicum	Lamiaceae	Acidness	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, cool then drink a cup after meal	Decoction	3	.025
Thymus vulgaris	Labiatae	Acidness	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, cool then drink a cup after meal	Decoction	3	.025
Sesamum indicum	Pedaliaceae	Acidness	Seeds/ eat raw	Eat raw	4	.033
Mentha piperita	Labiatae	Acidness	Leaves/ boil a cup of water then dunk the leaves in boiled water	Decoction	3	.025

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
			for 5 min, cool then drink a cup after meal			
Linumusit atissimum	Linaceae	Acidness	Seeds/ eat raw	Eat raw	2	.017
Prunus amygdalus	Rosaceae	Acidness	Seeds/ eat raw	Eat raw	25	.208
Salvia officinalis	Labiatae	Acidness	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, cool then drink a cup after meal	Decoction	3	.025
Rosmarinus officinalis	Labiatae	Indigestion	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, then drink hot after meal	Decoction	3	.025
Matricaria chamomilla	Compositae	Indigestion	Flower /boil about 100 ml of plant in 100 ml water, given orally	Decoction	5	.042
Petroselinum crispum	Umbelliferae	Indigestion	Leaves/ eat raw	Eaten raw	2	.017
Zingiber officinalis	Zingiberaceae	Indigestion	roots /boil about 100 ml of plant in 100 ml water, given orally	Decoction	3	.025
Cuminum cyminum	Umbelliferae	Indigestion	Seeds/ boil a spoon of seeds in a cup of water, drink it hot	Decoction	3	.025
Salvia officinalis	Labiatae	Indigestion	Leaves/ boil a cup of water then dunk the leaves in boiled water	Decoction	8	.067

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
			for 5 min, drink hot			
Mentha piperita	Labiatae	Indigestion	Leaves/ boil a cup of water, then dunk the leaves in boiled water for 5 min, drink hot	Decoction	25	.208
Pimpinella anisum	Umbelliferae	Indigestion	Seeds/ boil a spoon of seeds in a cup of water, drink it hot	Decoction	14	.117
Oryza sativa	Graminae	Vomiting & diarrhea	Seeds/ boil a cup of seeds in two cups of water, eat cooked	Eat cooked	2	.017
Solanum tuberosum	Solanaceae	Vomiting & diarrhea	Root/ eat cooked	Eat cooked	10	.083
Punica granatum	Lythraceae	Vomiting & diarrhea	Fruit/eat raw	Eat raw	8	.067
Allium sativum	Alliaceae	Vomiting & diarrhea	Root/ eat raw	Eat raw	3	.025
Zingiber officinalis	Zingiberaceae	Vomiting & diarrhea	roots /boil about 100 ml of plant in 100 ml water, given orally	Decoction	5	.042
Salvia officinalis	Labiatae	Vomiting & diarrhea	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	33	.275
Elettaria cardamomum	Zingiberaceae	Vomiting & diarrhea	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	2	.017
Matricaria chamomilla	Compositae	Constipation	flowers /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	4	.033

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
Ficus carica	Ficeae	Constipation	Fruit	Eat raw	5	.042
Trigonellafoenum graecum	Leguminosae	Constipation	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	9	.075
Ricinus communis	Acalyphoideae	Constipation	Fruit/squeeze the fruit and extract the oil/ drink one spoon of oil before meal	Drink cold	11	.092
Cassia angustifolia	Leguminosae	Constipation	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	12	.010
Cassia acutifolia	Leguminosae	Constipation	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	3	.025
Pimpinella anisum	Umbelliferae	Constipation	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	20	.167
Rosmarinus officinalis	Labiatae	Constipation	Leaves/ boil a cup of water then dunk the leaves in boiled water for 5 min, then drink hot after meal	Decoction	16	.133
Petroselinum crispum	Umbelliferae	Constipation	Whole plant	Eat raw	3	.025
Rosmarinus officinalis	Labiatae	Abdominal flatulence	Leaves/ boil a cup of water and then dunk the leaves in boiled water for 5 min, then drink hot after meal	Decoction	4	.033
Matricaria	Compositae	Ab-	Flower /boil	Decoction	3	.025

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
chamomilla		dominal flatulence	about 100 ml of plant in 100 ml water, given orally			
Cassia angustifolia	Leguminosae	Abdominal flatulence	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	1	.008
Trigonella foenumgraecum	Leguminosae	Abdominal flatulence	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	2	.0166
Crocus sativus	Iridacea*e*	Abdominal flatulence	Flower /boil about 100 ml of plant in 100 ml water, given orally	Decoction	1	.008
Zingiber officinalis	Zingiberaceae	Abdominal flatulence	roots /boil about 100 ml of plant in 100 ml water, given orally	Decoction	4	.033
Foeniculum vulgare	Umbelliferae	Abdominal flatulence	Roots	Eat raw	5	.042
Cuminum cyminum	Umbelliferae	Abdominal flatulence	Seeds/ boil a spoon of seeds in a cup of water, drink it hot	Decoction	28	.233
Citrus lemon	Rutaceae	Abdominal flatulence	Fruit	Juice	1	.008
Salvia officinalis	Labiatae	Abdominal flatulence	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	13	.108
Mentha piperita	Labiatae	Abdominal flatulence	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	23	.19
Pimpinella anisum	Umbelliferae	Abdominal	Seeds/ boil a spoon of	Decoction	19	.158

Scientific name	Family	GIT Problems	Parts used and mode of preparation	Method of preparation	# of informants 120	UV
		flatulence	seeds in a cup of water, drink it hot			
Matricaria chamomilla	Compositae	Irritable bowel syndrome	flowers /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	4	.033
Foeniculum vulgare	Umbelliferae	Irritable bowel syndrome	Roots	Eat raw	4	.033
Carum carvi	Umbelliferae	Irritable bowel syndrome	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	3	.025
Cuminum cyminum	Umbelliferae	Irritable bowel syndrome	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	6	.05
Salvia officinalis	Labiatae	Irritable bowel syndrome	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	4	.033
Mentha piperita	Labiatae	Irritable bowel syndrome	leaves /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	16	.133
Pimpinella anisum	Umbelliferae	Irritable bowel syndrome	seeds /boil about 100 ml of plant in 100 ml water, drink hot	Decoction	9	.075

Table (3): Plants used as home remedies for the treatment of gastrointestinal disorders in Palestine.

Plant name	Acidity	Indigestion	Vomiting & diarrhea	constipation	Abdominal flatulence	Irritable bowel syndrome
Chamomile بابونج FL	1 5.88	5 29.4	-	4 23.5	3 17.6	4 23.5
Ginger زنجبيل FL	1 6.25	3 18.75	5 31.25	1 6.25	4 25	2 12.5
Sesame سمسم FL	4 80	-	-	-	-	1 20
Schumer شمر FL	1 9.09	-	-	1 9.09	5 45.45	4 36.4

Plant name	Acidity	Indigestion	Vomiting & diarrhea	constipation	Abdominal flatulence	Irritable bowel syndrome
Latency كمون FL	1 2.56	3 7.7	-	1 2.56	28 71.8	6 15.38
Sage ميرمية FL	3 4.8	8 12.9	33 53.2	1 1.61	13 20.9	4 6.45
Mint نعنع FL	3 4.1	25 34.24	4 5.47	2 2.74	23 31.5	16 21.9
Rosemary اكليل الجبل FL	-	3 10.34	-	14 48.27	3 10.34	9 31.03
Anise يانسون FL	-	14 21.53	4 6.15	20 30.77	18 27.7	9 13.85
Sphericalكراوية FL	-	1 25	-	-	-	3 75
Lentilعدس FL	1 100	-	-	-	-	-
Carrots جزر FL	1 100	-	-	-	-	-
Crumple جعدة FL	2 40	1 20	2 40	-	-	-
Lettuce خس FL	1 33.3	1 33.3	-	1 33.3	-	-
Cucumberخيار FL	28 100	-	-	-	-	-
Pomegranate رمان FL	3 25	-	9 75	-	-	-
Basilريحان FL	3 100	-	-	-	-	-
Thymeزعتر FL	3 100	-	-	-	-	-
Oliveزيتون FL	4 80	-	-	1 20	-	-
Liquoriceعرقسوس FL	1 100	-	-	-	-	-
Pistachioفستق FL	1 100	-	-	-	-	-
Linenكتان FL	2 100	-	-	-	-	-
Roselle كركديه FL	1 100	-	-	-	-	-
Almondلوز FL	25 100	-	-	-	-	-
Cabbageملفوف FL	1 50	1 50	-	-	-	-
Cactusصبار FL	-	1 50	-	-	-	1 50

Plant name	Acidity	Indigestion	Vomiting & diarrhea	constipation	Abdominal flatulence	Irritable bowel syndrome
Marjoramبردقوش FL	-	1 50	-	-	1 50	-
Parsleyبقدونس FL	-	2 40	-	3 60	-	-
Appleتفاح FL	-	2 66.6	-	1 33.3	-	-
Datesتمر FL	-	1 50	-	1 50	-	-
Fenugreek pills حلبة FL	-	1 7.7	1 7.7	9 69.2	1 7.7	1 7.7
Castorخروع FL	-	1 8.3	-	11 91.6	-	-
Rashad beans حبوب الرشاد FL	-	1 100	-	-	-	-
Teaشاي FL	-	2 33.3	3 50	-	1 16.6	-
Senna) عشرق سنامكي) FL	-	1 5	-	16 80	-	3 15
Saussureacostus قسط هندي FL	-	1 50	-	-	-	1 50
Curcuminكركم FL	-	1 100	-	-	-	-
Riceأرز FL	-	-	2 66.6	1 33.3	-	-
Black bean الحبة السوداء FL	-	-	1 100	-	-	-
Potatoeبطاطا FL	-	-	11 100	-	-	-
Garlicثوم FL	-	1 33.3	2 66.6	-	-	-
Seedling grainشتيلة FL	-	-	1 100	-	-	-
Cinnamonقرفة FL	-	-	2 66.6	-	-	1 33.3
Coffeeقهوة FL	-	-	1 100	-	-	-
Lemonليمون FL	-	-	4 100	-	-	-
Bananaموز FL	-	-	1 100	-	-	-

Plant name	Acidity	Indigestion	Vomiting & diarrhea	constipation	Abdominal flatulence	Irritable bowel syndrome
Figتين FL	-	-	-	5 100	-	-
Saffronزعفران FL	-	-	-	1 100	-	-
Ginsengجنسنج FL	-	-	-	-	-	1 100

Table (4): Factors of informant's consensus (Fic) for herbals, categorized by the types of gastric treatment.

Problem	Total	Plant no	FIC
Acidness	91	24	0.74
Indigestion	81	24	0.71
Vomiting & diarrhea	86	20	0.78
Constipation	94	20	0.8
Abdominal flatulence	100	13	0.88
Irritable bowel syndrome	66	18	0.74

DISCUSSION

Several studies have shown that in developing countries, about 80% of rural communities consider herbal remedies to be relevant and important [27, 28].

According to Table 1, most informants are of the highest education with most of them (64.2 %) graduating from university, with the same percentage for medium-sized income. The table also showed that respondents (54.2%) typically get their natural products from "Attarines". Unlike (19.2 %) only from pharmacists, who are believed to be the community of experts with the requisite expertise and educational history on the protection and effectiveness of these products and are thus the most deserving to be trusted, this outcome indicates that these natural herbals and their products are considered healthy because of their long-standing use.

In Palestine, cosmetic products and natural nutrients are marketed and sold in herbal stores most of the time and to a lesser extent in pharmacies, and they are often prepared locally. Table 2 shows the natural herbal remedies used to treat gastrointestinal disorders, preparation method, and use. According to our findings, as stated in Table 2, the plants most frequently used were members of the Labiatae and Umbelliferae families, Labiatae family was also effective for the treatment of FGITD in Urmia, Iran[29] and it is known for its anti – inflammatory effect which could be helpful in some gastrointestinal infectious disease [30]. Leaves were the part used in Labiatae herbal products, while the seeds were the part of the plant used in the family Umbelliferae. It was concluded from similar studies on plants used for medicinal purposes that the most used parts of the plants are leaves with 54% in China and Thailand [31], 44% leaves and 29% root in Ethiopia [32]. Leaves are the main photosynthetic organ in plants and are considered the most effective component for the synthesis of many pharmacologically active preparations against certain diseases [33].

Decoction was the method of preparation, it means heating the herbs all or a specific part of it in water to boiling for a few minutes and taken orally as a hot drink. Sometimes a mixture of more than one plant species of a family or more may be used to insure a better efficacy, it may be sweetened by the addition of sugar or honey.

As can be seen in (Fig 4), The most prevalent gastrointestinal condition treated with natural products was abdominal flatulence, followed by constipation, heart burn, vomiting, and diarrhoea, indigestion and irritable bowel syndrome was the least common disorder.

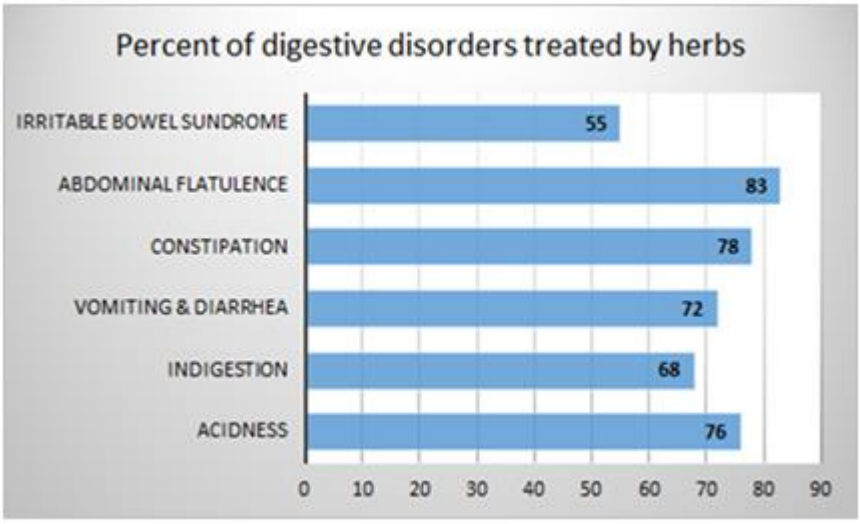

Figure (4): Percent of digestive disorders treated by herbs.

In this study, the highest level is indicated by fleidility values for *Cucumissativus* (100),, *Prunusamygdalus* (100) and *Sesamumindicum* (80) for heart burn; *Menthapiperita* (34.24) against indigestion; *Solanum tuberosum* (100), *Punicagranatum* (75) and *Salvia officinalis* (53.2) against vomiting and diarrhoea; *Ficuscarica* (100), *Ricinuscommunis* (91.6), *Cassia acutifolia* (80), *Rosmarinus officinalis (48.24)* and *PimpinellaAnisum (30.7) as* laxatives for constipation*; Cuminumcyminum (71.8)* and*Foeniculum vulgare (45.5)* for abdominal flatulence*; Carumcarvi(75), Foeniculum vulgare (36.5)* and *Rosmarinus officinalis* (31) against irritable bowel syndrome. These medicinal plants can be considered as an indication of their high healing potential against related diseases. Plants with high FL values and can achieve a cure, the bioactive components are identified and targeted in the future for phytochemical analysis...

Therefore the important medicinal plants for treating heart burn were *Curcumissativus* (UV = 0.233, FL = 100); for treating indigestion *Menthapiperita* (UV = 0.208, FL = 34.24); plant used for vomiting and diarrhoea is *Salvia officinalis* (UV = 0.275, FL = 53.2); for constipation *Pimpinellaanisum (UV*= 0.167, FL = 30.77); *Cuminumcyminum*(UV = 0.233 , FL = 71.8) for abdominal flatulence; finally *Menthapiperita* (UV = 0.13, FL = 21.9) against irritable bowel syndrome.

Table 5 summarises the published uses of these frequently used plants, the route of administration, and safe dose.

This research will help conserve and enhance the understanding of herbal plants in Palestine for gastrointestinal disorders. In the present study, Prunusamygdalus, *Matricariachamomilla, Ricinuscommunis,Zingiber officinalis, Salvia officinalis, Menthapiperita, Cuminumcyminum*and *Rosmarinus officinalis* were used mostly for treating digestive disorders at home.

CONCLUSIONS

This study successfully determined the prevalence of herbal medicine users in six gastrointestinal tract disorders, types of medicinal plants used in addition to the part of the plants used and the method of using among a representative sample of Palestinian adults and older adults. Up to our knowledge, this study is the first study in Palestine that explored the use of medicinal plants in GIT diseases.

It was found that the local population uses 40 plants from 16 separate families. Most of them grow in the wild, and some are cultivated from these medicinal plants. (i.e. *Menthapiperita,* and*Ficuscarica*). People use these plants for drying, decoction, or infusion during all seasons of the year. *Prunusamygdalus, Matricariachamomilla, Ricinuscommunis, Zingiber officinalis, Salvia officinalis, Cuminumcyminum, Menthapiperita and*

Rosmarinus officinalis are the most commonly used plants. The most commonly used sections of the plant were leaves and seeds. The quality of plant species fidelity and informant consensus factor values for plants have been developed. The Fic values were found to be fairly high (0.77). It may, therefore, be an indication that the data collected are accurate.

Table (5): Published medicinal uses of the most frequently used plants.

Plant species	Recorded literature sources defining similar usage
Mentha piperita	[34] [35]
Saliva officinalis	[36] [37] [38]
Cuminum cyminum	[39] [40]
Matricaria chamomilla	[41] [42] [43]
Zingiber officinalis	[44] [45] [46]
Ricinus communis	[47] [48] [49]
Pimpinella anisum	[50] [51] [52]
Prunus amygdalus	[54 ,53] [55]
Rosmarinus officinalis	[56] [57] [58] [59]

Ethical approval and consent to participate

The aims of this study, protocols and informed consent were approved by the Institutional Review Board (IRB) at An-Najah National University, as this study depends on a verbal questionnaire from adult participants (above 18 years old) so there is no need for written documented consent, and is approved by the ethics committee.

Competing interests

The authors declare that there are no financial competing interests.

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