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**The Digital Shift in Healthcare: Patterns, Attitudes, and Barriers Among Social Groups in Israel**

Original Research Article

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**Abstract**

**Background**

Online Health Services (OHS) have emerged as a response to healthcare challenges, offering a way to enhance system efficiency. Despite their numerous advantages, studies reveal varying efficacy among populations with differing sociodemographic characteristics. This study aims to describe OHS usage and its characteristics; examine knowledge, attitudes, barriers, and usage patterns among different groups in Israel; and present a predictive model for OHS consumption

**Method**

A cross-sectional study was conducted among Jewish and Arab populations in Israel, using a random representative sample stratified by gender, ethnicity, age, and religious affiliation. Sampling was further stratified by ethnicity and geographical region. Data were collected via an online questionnaire administered through iPanel’s records.

**Results**

The sample comprised 2001 participants with an average age of 47, half of them being women. The research add to the differentiation between low and high level technology. Participants reported absence of technological or emotional barriers and were more familiar with low-level technology and used it more frequently. Perceived efficacy of OHS was high, but some participants preferred face-to-face treatment. Predictors of familiarity and use of high-level OHS included being male, Arab, insured by the Clalit HMO, and having familiarity with OHS, high perceived health literacy, efficacy and safety.

**Conclusions**

 Online and face-to-face healthcare services are complementary to each other, while high-level and low-level online health services are distinct categories providing services for different healthcare needs. Since technological barriers are almost absent, access to OHS can expand more easily. Policymakers should focus on improving digital health literacy, particularly in the use of high level technologies, and map the needs of the elderly population to provide them with personalized services.

Keywords

Online healthcare services, attitudes, digital usage barriers, health literacy, high order technology, low order technology

**Background**

**Cconsumption of Online Health Services** - Online health services (OHS) offer a potential solution to healthcare challenges arising from population aging, the increase in chronic diseases, and rising healthcare costs. They are perceived as a tool for improving the availability and accessibility of medical services and enhancing system efficiency (Ministry of Economy and Industry, 2020; Idan et al., 2015; Kruse et al., 2018). Additionally, they are considered a promising solution for improving medical outcomes in various chronic conditions (Kamal et al., 2020).

OHS have been found to provide an effective solution for secure provider-patient communication, with treatment outcomes comparable to, and sometimes even better than, those of face-to-face medical care. This is particularly evident in mental health assessment and treatment, rehabilitation counseling, and nutrition management (Shigekawa et al., 2018).

The definition of OHS includes the remote provision of healthcare services using information and communication technologies for diagnosis, treatment, and prevention, as well as for continuous education and evaluation of healthcare providers (WHO, 2010). These tools encompass a wide range of applications, including two-way video conferencing, email, health apps, and other communication technologies.

**Consumption Characteristics and Barriers Use -** The scope of medical treatment via OHS increased dramatically following the COVID-19 pandemic. However, despite its potential, it is still characterized by technical and regulatory barriers that must be addressed to ensure broad and efficient implementation (Hall-Dykgraaf et al., 2021). These barriers include technical difficulties, resistance to change, cost, limited financial reimbursement, as well as patient age and education level (Kruse et al., 2018). Additionally, discomfort with adopting technology among both patients and healthcare providers, lack of attractiveness in using OHS, living in urban areas (Mann et al., 2020), and ethical and regulatory complexities regarding data security and privacy (Barkai et al., 2021) further contribute to these challenges.

Hall-Dykgraaf et al. (2021) found that during the lockdowns of the COVID-19 period, despite the availability of video-based medical consultations, the public preferred using telephone consultations. According to their findings, this indicates that significant barriers to video-based OHS still exist. Therefore, addressing these perception-related issues is necessary to drive a desirable and feasible implementation of OHS among both healthcare providers and patients.

 **Attitudes Toward OHS -** Patients with chronic illnesses have expressed high satisfaction with OHS; however, many still prefer face-to-face treatment despite their interest in consuming online health services (Edwards et al., 2014; Reicher et al., 2021).

Furthermore, OHS is perceived by patients as a complementary service to traditional medical care rather than a substitute (Reitzle et al., 2021).

An Israeli study conducted during the COVID-19 pandemic found that the majority of participants, including those with chronic conditions, preferred using digital health services over visiting a clinic. They reported satisfaction with the service and expressed a positive intention to continue using digital health services in the future (Reicher et al., 2021).

**Socio-Demographic Characteristics and Disparities in the Use of OHS-**

In Israel, there are health disparities linked to socio-demographic characteristics such as age, gender, and nationality, as well as infrastructure gaps (technological and other services across different regions) and differences in healthcare service utilization among various population groups (Rafaeli et al., 2018). Evidence suggests that these disparities have widened in recent decades.

Despite one of the major advantages of OHS being improved accessibility to healthcare, differences in OHS usage exist among different sectors. Minority groups and individuals from lower socio-economic backgrounds tend to use these services less frequently. A study based on large databases from the COVID-19 period in the U.S. showed that despite the availability of a wide range of OHS applications, disparities between different population groups persisted (Jaffe et al., 2020). For example, adults aged 45–46 were less likely to use these services compared to younger populations. Additionally, individuals living in urban areas were more likely to use OHS compared to those in rural regions.

In England, research indicated that OHS has the potential to exacerbate health disparities between disadvantaged groups and the general population (Latulippe et al., 2017). While international research on OHS is growing, in Israel, there are relatively few publications on the topic, particularly regarding its impact on special populations (Gamus & Chodick, 2020).

A review of studies on OHS usage reveals a lack of information regarding its benefits, as well as a gap in understanding the impact of socio-demographic factors on OHS adoption and the elements that could encourage greater use of this technology (Reicher et al., 2021). Further research is needed to better understand how variables such as age, sector, and gender influence the use of OHS.

**Method**

Aim

1. Describe the Consumption OHS and Its Characteristics – Examine knowledge, attitudes, barriers to use, consumption intentions, and usage patterns among various groups in Israel; 2. Examine the Relationships Between Knowledge, Attitudes, Barriers, and Intentions to Consume OHS; 3. Present an OHS consumption predicting model based on the research variables

 Design

A cross-sectional study including 2,001 participants (Jewish and Arab) aged 21 and older. The sampling was conducted using stratified layers based on sectors and seven geographical districts, according to the classification of the Israel Central Bureau of Statistics, ensuring full nationwide coverage (North, Haifa, Tel Aviv, Central, Jerusalem, South, and Judea & Samaria).

The sample represents the target population based on the variables of gender, sector, age group, and level of religiosity. Sampling within the different sectors and districts was conducted randomly. All sampling quotas were determined according to the proportions provided by CBS data.

Setting of the study

Data collection was conducted online in September 2022 using the internet panel of **iPanel**, which consists of approximately 100,000 panel members ([www.ipanel.co.il](http://www.ipanel.co.il)). The research instrument was translated into Arabic by a certified translator following academic principles of translation and back-translation. Participants were given the option to choose the questionnaire's language.

Prior to data collection, a pilot study was conducted with 70 participants—40 from the Jewish sector and 30 from the Arab sector. Based on the pilot findings, the response scale for the barriers questionnaire was revised from two categories to three.

characteristics of participants

Table 1 describes the background characteristics of the participants. The age range spans from 19 to 89 years (mean age: 47), with half of the participants being women (50.20%). The majority are Israeli-born, Jewish, secular, and affiliated with Clalit Health Services.

Approximately half of the participants hold an academic degree (48.42%), most are employed (62.10%), married or in a relationship (69.5%), and reside in central Israel (27.94%).

A minority of participants report having a chronic illness and taking medication regularly.

**Table 1**: Distribution of background characteristics of the study participants (N=2001).

| **Variable Name** | **Category** | **N** | **%** |
| --- | --- | --- | --- |
| Gender | Men | 996 | 49.80 |
|  | Women | 1005 | 50.20 |
| Place of Birth (N=1742) | Israel | 1283 | 73.65 |
|  | Other | 459 | 26.35 |
| Health Maintenance Organization (HMO) | Clalit | 1022 | 51.10 |
|  | Maccabi | 613 | 30.60 |
|  | Leumit | 126 | 6.30 |
|  | Meuhedet | 240 | 12.00 |
|  |  |  |  |
| **Religion** | Jewish | 1715 | 85.71 |
|  | Muslim | 229 | 11.44 |
|  | Christian | 33 | 1.65 |
|  | Druze | 25 | 1.25 |
| Level of Religiosity (Among Jews, N=1715) | Secular | 772 | 45.00 |
|  | Traditional | 587 | 34.20 |
|  | Religious | 180 | 10.50 |
|  | Ultra-Orthodox | 176 | 10.20 |

Age average (SD) 47.07 (16/81)

**Description of materials**

Questionnaire included four parts

**Part A - Attitudes, Knowledge, and Patient Experience Regarding the Use of Online Health Services (OHS)**

The final version of the questionnaire included 14 statements, rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Participants were asked to indicate their level of agreement with each statement.

The validity of the instrument was established through an exploratory factor analysis, which identified three factors:

* Effectiveness and Confidence in OHS – Includes 6 statements (α = 0.76) with an explained variance of 20.57%.
	+ Example statement: *"Medical diagnosis via online technology provides results that are just as accurate as those obtained in a face-to-face consultation."*
* Online Health Literacy – Includes 5 statements (α = 0.80) with an explained variance of 19.92%.
	+ Example statement: *"I know how to use online technology to define my health problems."*
* Preference for Face-to-Face Treatment – Includes 3 statements (α = 0.74) with an explained variance of 16.62%.
	+ Example statement: *"Communicating with healthcare providers via online technology will reduce the quality of medical care."*

**Part B – OHS Barriers**

This section includes 7 statements, each assessed independently. Since each statement stands alone, reliability analysis was not conducted.

* Technological Barriers – Assessed through 4 statements, examining continuous and reliable internet access, availability of a laptop/desktop computer, and a smartphone.
* Emotional Barriers – Assessed through 3 statements:
	+ *"Online services are not available in my native language."*
	+ *"I do not know how to use digital technology."*
	+ *"I do not want to talk to a provider I am unfamiliar with."*

Each statement in this section had three possible responses:*"Applies to me and prevents me from using online services”; "Applies to me but does not prevent me from using online services"; "Does not apply to me."*

 **Section C – Familiarity and Frequency Usage of OHS**

This section consists of 10 statements that assess familiarity with various OHS and the frequency of their use.

* Familiarity with the service is measured dichotomously (Yes/No).
	+ Example: *"I have had a video call with a doctor."*
* If the participant is familiar with the service, they are asked to report their frequency of use on a 1–6 scale:
	+ 1 = Never, 6 = Once a week or more

Exploratory factor analysis identified two factors:

1. Low Order Technology (LOT) – Characterized by commonly accepted and widely used basic technologies.
	* Includes 5 statements (α = 0.80) with an explained variance of 24.64%.
	* Example statements:
		+ *"I had a phone consultation with my family doctor."*
		+ *"I scheduled an appointment through my HMO’s website or app."*
2. High Order Technology (HOT) – Characterized by more advanced technologies that require digital literacy.
	* Includes 5 statements (α = 0.93) with an explained variance of 37.67%.
	* Example statements:
		+ *"I received mental health services (psychiatry, psychotherapy, social work) via a phone call."*
		+ *"I underwent a remote medical examination using digital tools (e.g., transmitted blood pressure, ECG, etc.)."*

**Section E – Socio-Demographic Background** - This section includes 15 items, covering demographic and personal details such as gender, age, sector, marital status, place of residence, religion, level of religiosity, HMO affiliation, and more.

**Statistical Analysis**

**Descriptive Statistics** – Describing participants and their socio-demographic characteristics. This included distributions of key research variables, both overall and based on relevant background variables (e.g., gender, age, education), as well as calculating correlations between different variables.

**Factor Analysis** – Exploratory and Confirmatory Factor Analysis (EFA & CFA) were conducted for Sections A and C of the research instrument.

**Reliability Analysis** – Internal reliability for some of the questionnaires was assessed using Cronbach's alpha. Additionally, for each participant, an overall mean score was calculated for all questionnaire items, along with separate mean scores for each subscale, based on the relevant items within each questionnaire (where applicable).

**Hypothesis Testing** – The research hypotheses were examined using hierarchical regression analysis, accounting for various background variables.

The selected sample size allowed for in-depth analyses based on sector affiliation, HMO affiliation, level of religiosity, and other relevant demographic factors.

**Results**

**Attitudes, Knowledge, and Patient Experience Regarding the Use of Online Health Services (OHS)**

Table 2 indicates that participants, on average, rate online health services as effective and safe and perceive themselves as having relatively high online health literacy.

However, the lowest score was recorded for face-to-face treatment, with more than half of the respondents preferring in-person care over online health services.

**Table 2 – Attitudes and Knowledge Toward OHS (N = 2001)**

| **Variable** | **Effectiveness and Confidence in Online Treatment** | **Online Health Literacy** | **Preference for Face-to-Face Treatment** |
| --- | --- | --- | --- |
| **Mean (SD)** | **3.65 (0.63)** | **3.79 (0.73)** | **3.35 (0.64)** |

**Technological and Emotional Barriers**

Approximately 90% of participants reported no technological barriers, stating that they possess the necessary technological means to access OHS. Among the small percentage of respondents who lacked technological resources, most indicated that this did not prevent them from using OHS.

A similar pattern was observed regarding emotional barriers. However:

* 11.7% of participants reported difficulty trusting a healthcare provider they do not know.
* 10.4% stated that they do not want to consult with an unfamiliar health care provider.

**Familiarity and Frequency of OHS Use**

Familiarity with Low-Order and High-Order Technology – Overall, a higher percentage of participants are familiar LOT services (63.9%–94.5%) compared to HOT services (26.1%–70.1%). More than 50% of participants are unfamiliar with HOT such as mental health consultations, nutrition counselling, and online medical examinations (Table 3).

Additionally, when analyzing familiarity by HMO affiliation, it was found that

Clalit HMO members are more familiar with HOT technology services, such as *"Online medical examinations using various tools (e.g., blood pressure transmission, ECG, throat examination using the TYTO device) ",* and less familiar with low-order technology services compared to members of other HMOs.

**Table 3** – Familiarity with OHS

|  |
| --- |
|  | Queries | Yes (%) |
| **Low Order Technology** | Phone call with primary physician | 94.5 |
| Scheduling an appointment via website or app | 96.7 |
| Correspondence with primary physician via mail | 63.9 |
| Phone call with a nurse | 81.9 |
| Requesting prescriptions via website or app | 90.3 |
| **High Order Technology** | Video call with primary physician | 73.9 |
| Dietary consultation | 33.8 |
| Telephone consultation with a specialist | 62.5 |
| Online medical check-up | 41.4 |
| Online mental health services | 29.9 |

Frequency of Use of Low-Order and High-Order Technology - On average, the frequency of use of low-order technology is approximately once every three months (M = 3.0, SD = 0.92). In contrast, the frequency of use of high-order technology is once every six months or less frequently (M = 1.81, SD = 0.91).

Additionally, more than 50% of participants familiar with high-order technology have never used these services, except for telephone consultations with a specialist, which were used by 68% of participants.

**Table 4 - Pearson correlations**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| **1** | **·** |  |  |  |  |  |  |  |  |
| **2** | **\*\*\*0.67** | **·** |  |  |  |  |  |  |  |
| **3** | **\*\*\*0.37-** | **\*\*\*0.28-** | **·** |  |  |  |  |  |  |
| **4** | **\*\*\*0.17-** | **\*\*\*0.22-** |  **\*0.05** | **·** |  |  |  |  |  |
| **5** | **\*\*\*0.30-** | **\*\*\*0.31-** | **\*\*\*0.19** | **\*\*\*0.27** | **·** |  |  |  |  |
| **6** |  **\*\*0.22** | **\*\*\*0.29** | **\*\*\*0.08-** | **\*\*\*0.20-** | **\*\*\*0.21-** | **·** |  |  |  |
| **7** | **\*\*\*0.18** | **\*\*\*0.19** |  **\*0.05-** |  **\*\*0.06-** |  **\*\*0.06-** | **\*\*\*0.39** | **·** |  |  |
| **8** | **\*\*\*0.09** | **\*\*\*0.18** |  **0.01-**  | **0.02** | **0** | **0.02** | **\*\*\*0.07** | **·** |  |
| **9** | **\*\*\*0.04** | **0.04** |  **0.04-** | **\*\*\*0.11** | **\*\*\*0.11** | **\*\*\*0.10-** | **\*\*\*0.07** | **\*\*\*0.48** | **·** |

 **\*p<.05, \*\*p<.01, \*\*\*p<.001**

Legend:

1.Effectiveness and Confidence in Online Treatment 2. Online Health Literacy 3. Preference for Face-to-Face Treatment 4. Technological Barriers 5. Emotional Barriers 6. Familiarity with LOT 7. Familiarity with HOT 8. Frequency of Use of LOT 9. Frequency of Use of HOT

From **Table 4**, the following significant correlations were observed:

* Moderate to high positive correlations were found between Effectiveness and Confidence in OHS and Online Health Literacy (r = 0.67, p < .001). Positive low correlations were also found between Effectiveness and Confidence in OHS and Familiarity with LOT (r = 0.22, p < .001) as well as Familiarity with HOT (r = 0.18, p < .001).
* Weak positive correlations were found between Effectiveness and Confidence in Online Treatment and Familiarity with Low-Order Technology (LOT) (r = 0.22, p < .001) as well as Familiarity with High-Order Technology (HOT) (r = 0.18, p < .001).
* Weak to moderate positive correlations were also found between Online Health Literacy and Familiarity with LOT (r = 0.29, p < .001); Familiarity with HOT (r = 0.19, p < .001); Frequency of Use of LOT (r = 0.18, p < .001)
* Weak negative correlations were found between Technological and Emotional Barriers and Familiarity with LOT (r = -0.20, p < .001 and r = -0.21, p < .001, respectively).
* Moderate positive correlations were observed between Familiarity with LOT and HOT (r = 0.39, p < .001) and frequency of Using LOT and HOT (r = 0.48, p < .001)
* A weak positive correlation was found between Preference for Face-to-Face Treatment and Emotional Barriers (r = 0.19, p < .001).

Differences Between Socio-Demographic Groups

Significant differences were found among various groups in the study regarding sector, gender, and region of residence. The differences were analysed using independent t-tests and one-way ANOVA.

Sector

* Jewish participants perceived higher effectiveness and confidence in OHS (M = 3.70) compared to Arab participants (M = 3.41; t(370.41) = 6.84, p < 0.001).
* Online health literacy was also higher among Jews (M = 3.85) than Arabs (M = 3.48; t(1999) = 7.89, p < 0.001).
* Preference for face-to-face treatment was lower among Jews (M = 3.30) than Arabs (M = 3.69; t(409.27) = 7.90, p < 0.001).
* Conversely, Arabs were more familiar with HOT (M = 2.66) compared to Jews (M = 2.37; t(362.69) = 2.71, p < 0.01) and reported more frequent use of HOT (M = 2.06) than Jews (M = 1.77; t(298.58) = 3.89, p < 0.001).

Gender

* Women reported higher online health literacy (M = 3.82) than men (M = 3.76; t(1999) = 2.06, p < 0.05) and used LOT more often (M = 3.20) than men (M = 2.95; t(1979) = 6.10, p < 0.001). Men showed a stronger preference for face-to-face treatment (M = 3.40) compared to women (M = 3.31; t(1999) = 2.30, p < 0.05).

Region of Residence

* Preference for face-to-face treatment was significantly higher among participants living in Northern Israel compared to other regions (F(6,1994) = 8.37, p < 0.001).

**Predicting Familiarity and Usage of HOT and LOT**

Since familiarity and usage of LOT were high, the prediction model focused only on familiarity and frequency of use of HOT using multiple regression analysis.

The regression model for predicting familiarity and frequency of use of HOT included the following variables: Effectiveness and confidence in online treatment; Online health literacy; Preference for face-to-face treatment; Age; Familiarity with LOT; Frequency of use of LOT; Sector (Jewish/Arab); Gender; HMO affiliation

The regression results are presented in Tables 5 and 6.

**Table 5** Prediction of Familiarity with HOT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | B | S.E | t | Beta |
| Constant | 200 | 277 |  |  |
| **Efficacy and confidence in OHS** | **.252** | **0.65** | **3.89\*\*\*** | **.104** |
| Online health literacy | .62 | .57 | 1.08 | .030 |
| **Preference for face-to-face care** | **-.25** | **.011** | **2.28\*** | **-0.048** |
| **Age** | **-.017** | **002.** | **8.82\*\*\*** | **-.187** |
| **Familiarity with LOT** | **.645** | **0.33** | **19.5\*\*\*** | **.410** |
| **Sector (Jews=1)** | **-.459** | **0.91** | **5.04\*\*\*** | **-.105** |
| **Gender (Male=1)** | **.175** | **.60** | **2.88\*\*** | **.057** |
| Health fund - Leumit=1 | -.233 | .127 | 1.83 | -.037 |
| **Health fund - Meuhedet=1** | **.-208** | **097.** | **2.14\*** | **-.044** |
| **Health fund - Maccabi=1** | **-.473** | **070.** | **6.72\*\*\*** | **-.143** |

|  |  |
| --- | --- |
|  | R2=0.23 p<.001 f(10,1990)=59.72, p<.001 |
|  | \*p<.05, \*\*p<.01, \*\*\*p<.001  |

From Table 5, it can be observed that the likelihood of familiarity with HOT technologies increases among male users (β = .175, p < 0.01), Arabs (β = -.459, p < 0.001), and those insured by Clalit Health Services. Additionally, the likelihood of familiarity with high-level technology increases with a greater sense of efficacy and confidence in online healthcare (β = .252, p < 0.001) and familiarity with low-level technologies (β = .645, p < 0.001).

Conversely, the likelihood of familiarity with high-level technologies decreases with increasing age (β = -.017, p < 0.001), preference for face-to-face care (β = -.025, p < 0.05), membership in Meuhedet Health Fund (β = -.208, p < 0.05), and membership in Maccabi Health Fund (β = -.473, p < 0.001). The predictive power of the model is 23%.

# **Table 6** Prediction of frequency usage of HOT

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | B | S.E | t | Beta |  |
| Constant | .429 | .186 |  |  |  |
| **Efficacy and confidence in OHS** | **.102** | **.041** | **2.48\*** | **.071** |  |
| **Online health literacy** | **-.008** | **.36** | **2.23\*** | **-.062** |  |
| Preference for face-to-face care | .031 | .024 | 1.31 | .029 |  |
| **Age** | **.004** | **.001** | **3.73\*\*\*** | **-.079** |  |
| **Frequency usage of LOT** | **.495** | **.021** | **23.47\*\*\*** | **.498** |  |
| **Sector (Jews=1)** | **.147** | **.057** | **2.59\*\*** | **-.059** |  |
| **Gender (Male=1)** | **.132** | **.038** | **3.46\*\*\*** | **.073** |  |
|  Leumit Health fund=1 | .070 | .077 | .92 | .019 |  |
| **Meuhedet Health fund=1** | **.137** | **.060** | **2.28\*** | **-.049** |  |
| **Maccabi Health fund=1** | **.185** | **.044** | **4.22\*\*\*** | **-.093** |  |

R2=0.261 p<.001 f(10,1760)=62.016, p<.001

\*p<.05, \*\*p<.01, \*\*\*p<.001 From Table 6, it can be observed that the frequency of using HOT technologies increases among male users (β = .073, p < .001), the Arab sector (β = -.059, p < .05), and those insured by Clalit Health Services. Additionally, the frequency of using high-level technology increases with a higher perceived efficacy and confidence in online healthcare (β = .071, p < .05) and the frequency of using low-level technologies (β = .498, p < .001).

Conversely, the frequency of using high-level technologies decreases with lower online health literacy (β = -.062, p < .05), increasing age (β = -.079, p < .001), membership in Meuhedet Health Fund (β = -.049, p < .05), and membership in Maccabi Health Services (β = -.093, p < .001). The predictive power of the model is 26.1%.

**Discussion**

The current study examines the factors influencing familiarity with and use of online health services (OHS) in Israel, focusing on levels of digital health literacy, attitudes toward service quality, efficiency, and safety, and the relationship between sociodemographic characteristics and the frequency of using these technologies.

The primary contribution of this research lies in distinguishing between the use of low-level technologies (such as appointment scheduling and prescription retrieval) and high-level technologies (such as video consultations for diagnosis and counseling). It also deepens the understanding of the impact of emotional and technological barriers on the use of OHS. Additionally, the study identifies sectoral and age-related disparities and addresses minority groups that have not been adequately examined in previous research.

**Familiarity and frequency of OHS usage -** Online health technologies have numerous definitions, and research on this topic often refers to different technologies without specifying the exact ones involved. A unique contribution of the current study focuses on two variables related to OHS consumption: the type of technology (high-level or low-level) and familiarity/frequency of use of online health technologies.

Low-Order Technology (LOT) refers to well-established technologies used over time, mainly for administrative purposes, such as phone calls, emails, and prescription requests. In contrast, High-Order Technology (HOT) involves video consultations, medical counseling, mental health services, diagnostics, and examinations.

The study found that, in general, a higher percentage of participants were familiar with OHS characterized by LOT compared to services categorized as HOT. Moreover, not everyone familiar with a technology necessarily uses it. For example, approximately 70% of respondents were aware of video consultations with a doctor, yet only about 45% reported using them at varying frequencies. A similar pattern was observed in mental health services, where familiarity and frequency of use were higher for LOT compared to HOT.

On average, the frequency of using LOT services was once every three months, whereas the frequency of using HOT services was once every six months or longer. The study suggests that OHS usage frequency in Israel is higher than in other countries. A 2021 survey conducted in the United States found that only 37% of patients had used OHS at least once a year (Lucas & Villarroel, 2022). Other studies report that during COVID-19, the use of video-based telemedicine increased by 603%, particularly in emergency medicine and among younger patients (Mann et al., 2020; Ugalmugale & Swein, 2020), although they do not provide detailed data on usage frequency.

Ebbert et al. (2021) argue that prior experience with OHS increases the likelihood of future use. The findings of the current study indicate that HOT usage frequency is strongly linked to LOT usage frequency and is influenced by digital health literacy skills. Therefore, efforts to increase familiarity with and accessibility of OHS should focus on enhancing digital health literacy and raising awareness of HOT services. Encouraging the use of HOT services could facilitate a "leap forward" in diagnostics and treatment, making OHS more accessible to the general population.

**Technological and Emotional Barriers to use OHS** - Most of the population has access to the technological means required to use online health services, and the majority are capable of utilizing the available services. This finding aligns with another study conducted during the COVID-19 pandemic in Israel, which reported that only 21% of respondents experienced technological difficulties (Barkai et al., 2021).

These findings contrast with the international literature, which highlights barriers related to technical difficulties, resistance to change (Kruse et al., 2018), as well as lack of appeal and discomfort in using such services (Mann et al., 2020).

**Attitudes Toward OHS -** Attitudes toward OHS are influenced by three key factors: digital health literacy, perceived efficacy and confidence in online healthcare, and preference for face-to-face care. The study found a strong positive correlation between perceived efficacy in online healthcare and digital health literacy, while both were negatively correlated with a preference for face-to-face care. This suggests that as confidence in OHS and digital health literacy increase, the public’s preference for in-person treatment decreases.

Digital health literacy and access to digital health technologies have been identified as key factors in determining the quality of healthcare services. In the current study, participants generally perceived themselves as having relatively high digital health literacy. However, about one-quarter of them only partially utilize online infrastructures for seeking information about illnesses and accessing health services, despite these services being available and accessible. Low health literacy, or an inability to understand medical terminology and patient instructions, may lead to poor adherence to treatment and medication misuse (Wanngdhal et al., 2018). Thus, the healthcare system faces the challenge of identifying populations in need of improved health literacy and focusing efforts on enhancing these skills.

Perceived Efficacy and confidence in OHS - OHS are perceived in the current study as effective and diverse, as they provide an additional treatment channel. This finding aligns with the increased adoption of digital healthcare services during and after the COVID-19 pandemic in Israel, where most participants preferred digital health services over in-person clinic visits (Reicher et al., 2021). Similar trends have been reported in global studies (Chu et al., 2021; Polinski et al., 2016).

From a policy perspective, it is crucial to continuously monitor OHS usage and public perception to further develop and expand these services as needed.

An examination of perceived efficacy and confidence in online healthcare reveals that public trust in some services remains relatively low. Only 30-40% of participants agreed that diagnosis and treatment via online technology yield results comparable to in-person consultations. Additionally, only about half of respondents partially agreed that group therapy via computer makes treatment more accessible to those unable to attend in-person sessions. More than half of respondents preferred face-to-face consultations with a physician or other healthcare provider (especially among Arab participants), and most had no strong opinion on the quality of online healthcare services.

These findings are consistent with an Israeli study that found both patients and physicians prefer in-person consultations over online video consultations (Chudner et al., 2019). One possible explanation for this preference is the existing incentive model for physicians.

A pre-COVID-19 study found that most patients rated OHS as either good or equivalent to in-person services, but only one-third preferred online consultations (Polinski et al., 2016).

The fact that perceptions of OHS efficacy, trust, and digital health literacy are relatively high in the current study, yet face-to-face treatment is still preferred, suggests that OHS should not replace in-person care but rather serve as a complementary service. This conclusion aligns with findings from similar studies (Reitzle et al., 2021).

Integrating Online and Traditional Healthcare Services - In this context, researchers from the Mayo Clinic suggest that, given the advantages of digital health technologies, they should be integrated into traditional care to create virtual interactions between healthcare providers and patients between visits (Philpot et al., 2023).

Given these insights and the expansion of OHS policies, it is essential that health service providers, particularly health maintenance organizations (HMOs), focus on strengthening public trust in these services and continuously monitoring their quality.

**Predictors of Familiarity and Frequency usage of HOT -** Given the finding that most participants are familiar with and use low-order technology (LOT), we conducted a multivariate regression analysis to identify the variables predicting familiarity and use of HOT exclusively.

Age - The study found that familiarity and frequency of use of HOT decrease with age. The literature presents conflicting findings regarding the relationship between age and digital technology use, with no clear distinction on the specific types of technology being used. Some studies have reported a negative correlation between age and online technology use (Tipre et al., 2022). Another study found that adults over 45 were less likely to use digital health services (Jaffe et al., 2020). However, an Israeli study found that the use of LOT was similar among individuals aged 64-75 and younger age groups in terms of usage frequency (Even-Zohr et al., 2017).

These conflicting findings regarding OHS usage, particularly HOT, highlight the need for further research to understand the role of age in predicting engagement with these services.

Ethnic Sector as a Predictor - Another predictor of HOT use and familiarity was Arab sector affiliation. This finding may seem unexpected, given that three-quarters of Arab respondents reported having low or significantly below-average incomes, residing mostly in peripheral areas, and being classified as a disadvantaged population. Studies in other countries have shown opposite findings, where populations living in urban areas were more likely to use OHS than those in rural areas (Latulippe et al., 2017). Furthermore, ethnic minority populations from lower socioeconomic backgrounds have been found to use OHS less frequently (Mehta et al., 2020).

A possible explanation for the findings regarding Arab participants in Israel is that their access to face-to-face healthcare services is more limited, compelling them to rely on HOT services. A relevant example is online dietitian consultations, which are classified as HOT technologies. Given high rates of diabetes and obesity in the Arab population, and the limited accessibility of dietitian services in peripheral areas, it is plausible that these constraints drive familiarity with and use of HOT services.

Gender Differences in HOT Use- Men were found to have a higher likelihood than women of being familiar with and using HOT technologies, a finding consistent with other studies reporting gender differences in OHS consumption (Jaffe et al., 2020).

Beyond gender-related demand-side differences, OHS could also help reduce gender disparities in healthcare supply by enhancing women's skills through support, supervision, proper guidance, and program development (George et al., 2018; Sinha, 2018).

Health Fund Affiliation - Health fund membership was also found to be a significant predictor. Membership in Clalit Health Services increased the likelihood of HOT familiarity and use.

A possible explanation for this is that the survey included items on familiarity and use of diagnostic technologies associated with HOT, such as online medical check-ups using devices like blood pressure monitors, ECG transmission, and the TYTO device. Other health funds have primarily developed OHS focused on LOT.

An Israeli study on HMO preferences for online physician consultations versus face-to-face care found that health funds expressed a need and desire to expand digital health services (Chudner et al., 2019). These findings support the expansion of HOT services across all health funds.

Perceived Efficacy and Digital Literacy as Predictors

Perceived efficacy and confidence in online healthcare were also significant predictors of familiarity with and use of HOT. Additionally, the likelihood of using HOT decreased among those with lower digital health literacy. This underscores the critical role of digital health literacy in the adoption of HOT technologies.

This finding is consistent with an Israeli study that identified digital health literacy as the strongest predictor of OHS usage (Reicher et al., 2024).

**Policy Implications and Recommendations for Decision-Makers**

* OHS Should Be Categorized by Service Type
Online health services include two distinct types: low-order technology (LOT) and high-order technology (HOT). Therefore, OHS usage cannot be analyzed as a single entity. It is crucial to map these different service types across healthcare providers to better understand their implementation and accessibility.
* Focus on Improving Digital Health Literacy and HOT Familiarity
Efforts to increase public familiarity with and accessibility of OHS should primarily focus on enhancing digital health literacy and expanding the use of HOT technologies. Greater adoption of HOT will enable significant advancements in diagnostics and treatment, leveraging advanced monitoring devices with data transmission capabilities and virtual consultations, which are essential for managing various medical conditions.
* Leveraging Existing Technological Infrastructure
Given that technological infrastructure is widely available in most households, the Ministry of Health, in collaboration with the "Digital Israel" initiative, can harness information and communication technologies (ICTs) to enhance the delivery of online healthcare services (Digital Israel, 2018).
* Integrating Online and In-Person Healthcare Services
Online healthcare and face-to-face care are complementary services, not substitutes. Therefore, strategies should be developed to integrate both approaches, tailoring them to different treatment processes, health conditions, and healthcare organizations.
* Age-Specific Adaptation of Online Health Services
Since familiarity with and frequency of OHS use decrease with age, OHS should not be the sole or primary care approach for older adults. Healthcare providers should assess the specific needs and capabilities of the elderly population and develop personalized service frameworks to ensure accessibility and usability.
* Further Research on OHS Use in the Arab Sector
The findings regarding OHS use among the Arab population raise important questions and necessitate further research. While Arabs prefer face-to-face care and are less likely to use LOT, they demonstrate relatively high usage of HOT. Future studies should explore the underlying reasons for this pattern to better inform policy and service design.

**Conclusions**

 The study highlights unique aspects of the Israeli healthcare landscape and proposes practical solutions for expanding and tailoring the accessibility of online health services (OHS). It offers a novel perspective on OHS consumption in Israel, suggesting ways to increase usage effectively while addressing the specific needs of different population groups.

* Integrating Online and In-Person Healthcare- While the study underscores the advantages of OHS, it also emphasizes the importance of integrating online and face-to-face services to enhance the efficiency and accessibility of the healthcare system. OHS should not replace traditional care but rather complement it, necessitating the development of hybrid models that allow flexibility between online and in-person care based on patient needs and health conditions across different healthcare organizations.
* Differentiating Between LOT and HOT - The study provides a new perspective on OHS familiarity and use in Israel by distinguishing between low-order technologies (LOT) and high-order technologies (HOT). Policymakers and healthcare providers should not treat OHS as a single entity, but rather map the availability of these different service types across providers.
* Leveraging Technology and Addressing Barriers - The lack of significant technological barriers identified in the study presents an opportunity for the Ministry of Health to expand OHS further. This should be done by enhancing digital health literacy and strengthening users’ confidence, particularly in adopting HOT technologies.

Although access to digital technologies is high, some respondents reported difficulty consulting with unfamiliar healthcare providers, indicating a need to enhance trust in online healthcare services.

* Addressing the Needs of Vulnerable Populations - Investment in tailored OHS solutions is especially critical for older adults, disadvantaged communities, and residents of peripheral areas. While younger populations tend to utilize HOT more frequently, older adults continue to prefer face-to-face care.
* Understanding OHS Use in the Arab Sector - Findings regarding OHS usage among the Arab population highlight disparities that require further research to better understand their specific needs and barriers. Identifying these challenges will be essential in ensuring equitable access to digital healthcare services.

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* **List of abbreviations**

**OHS – Online Health Care Services**

**LOT = Low Order Technology**

**Hot = High Order Technology**

**Declarations**

All manuscripts must contain the following sections under the heading 'Declarations':

* Ethics approval and consent to participate - Ethical approval was obtained from the Ethics Committee of the Research Authority at Ono Academic College.
* Consent for publication – Not applicable
* Availability of data and materials – The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
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* Authors' contributions - The authors' responsibilities were as follows –OT and SR designed the study and wrote the proposal grant, participated in the statistical analysis and wrote the manuscript; GM performed the statistical analyses and contributed to the interpretation of the research findings and the design of additional statistical analyses. All authors read and approved the final manuscript.
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