Original Paper

Health Literacy in the Age of Digitalization in Switzerland: Cross-Sectional Representative Study

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Abstract

Background: To cope with the challenges of digital transformation in health and well-being, people need digital health literacy (DHL), namely the competencies to access, understand, appraise, and apply digital health–related information and services for their own and others' health and well-being. So far, however, there have been no data on the level of DHL in Switzerland.

Objective: As part of the international Health Literacy Survey 2019-2021 (HLS_{19}), this study aimed to close this gap by investigating DHL, the population groups particularly affected by low DHL, its health-related consequences, as well as use of digital information sources in the general population in Switzerland.

Methods: Participants were recruited from the Swiss Federal Statistical Office sampling frame using stratification by linguistic region, age, and gender. Of the 4764 individuals contacted, 2554 completed the survey (response rate: 53.6%). Responses from 52 participants were excluded because fewer than 80% of the general health literacy items had been completed. Additionally, 168 participants from the overall study sample were excluded from the calculation of the digital health literacy score (HL-DIGI) because of insufficient completion of the DHL items. DHL of 2334 people was assessed between March and April 2020 with an online questionnaire. Descriptive statistical analysis, Pearson chi-square tests, Spearman rank correlations, and multivariable linear regression analyses were performed to examine DHL and its associations with sociodemographic characteristics, health-related consequences, and use of digital information sources.

Results: Most of the respondents report inadequate (1034/2334, 44.3%) or problematic (651/2334, 27.9%) DHL levels. DHL resulted to be negatively associated with older age (B=−0.278, 95% CI −0.371 to −0.185), greater financial deprivation (B=−0.101, 95% CI −0.148 to −0.054) and migration background (B=−5.992, 95% CI −8.990 to −2.994), and positively associated with education in the health sector (B=11.337, 95% CI 7.720 to 14.953) and social support (B=1.109, 95% CI 0.308 to 1.909). In addition, lower educational attainment was associated with lower DHL scores compared with having a master's degree or higher. Higher DHL was associated with better self-assessed general health status (odds ratio [OR] 1.005, 95% CI 1.003-1.007), improved self-management (OR 0.989, 95% CI 0.984-0.993), and lower likelihood of experiencing restrictions of usual activities due to health problems (OR 1.004, 95% CI 1.001-1.007). Furthermore, people with higher DHL tend to rely more on face-to-face information from health care professionals and to use digital sources less frequently.

Conclusions: This study offers first insights into the DHL of the population in Switzerland and indicates that almost three-quarters (72.2%) of the population have low DHL. These results are in line with those of other European countries and clearly show the urgency of measures to improve DHL, especially among vulnerable population groups.

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KEYWORDS

digital health literacy; eHealth; digitalization; digital transformation; digital health information

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Introduction

Digital Transformation of Health and Health Care Services

The digital transformation of our society and of the health system has radically influenced health care services, people's mindsets and health behavior, as well as the generation, provision, and management of health information [1]. Hence, these developments have led to a vast amount of health-related information being accessible through various channels, including the internet, social media, and digital media in general [2]. As a result, there has been a rapid growth in the use of digital sources to search for health-related information in recent years, making the internet one of the most widely used sources for health information [3-5], next to physicians and other health professionals [6]. A study conducted in Switzerland during the COVID-19 pandemic found that the internet was the second most used source of COVID-19–related information after television [7]. The same study also examined the use of social media as a distinct information source and found that a quarter of the Swiss population searched for health information on social media during the pandemic [7].

On the one hand, the Swiss health care system can definitely benefit from the ongoing digital transformation in several domains ranging from improved quality of care (eg, more accurate diagnosis, clinical decision support, fewer medical errors, real-time access to patient history, and personalized medicine), to enhanced and more efficient care provision (eg, supported administration, remote monitoring, and consultations), better and more equitable access (eg, addressing communication difficulties and navigation) as well as people empowerment and engagement (eg, supporting patients to take a more active role and increased adherence to medical treatment) [2,8]. Similar benefits may also extend to other health care systems in Europe and beyond. On the other hand, the digital transformation also brings risks, as, for example, people who are not familiar with new technologies or do not even have access to a digital service or device might have greater difficulties accessing health information and might not benefit in the same way from current developments and technologies [9]. Thus, such difficulties among certain population groups are likely to increase health and social inequities [10]. Other important challenges concern privacy issues (ie, breaches of privacy) [9], and the spread of misinformation and disinformation. This became particularly apparent during the COVID-19 pandemic, where a rapid spread of valid and invalid information through different communication channels caused a so-called "infodemic" [5,11,12]. Such an overload of conflicting, unverified, and invalid information can lead to confusion, uncertainties, and risk-taking behaviors, damaging populations' health and well-being [13], eroding trust, and endangering public health and social cohesion [11].

Importance of Digital Health Literacy to Face Current Challenges

Digital health literacy (DHL) is understood as part of health literacy (HL) and encompasses the ability to find, understand, appraise, and apply health information from digital sources in order to make decisions in daily life that have a positive impact on health [14]. This definition is closely aligned with the common understanding of HL [15]. Accordingly, DHL empowers people to make decisions for their own and others' health and well-being in the fields of health care, disease prevention, and health promotion [15]. Furthermore, both HL and DHL have been confirmed to be determinants of health and thus of several health-related consequences, for example, self-reported health status, health behavior, use of health services, and thereby also health care costs [8,16,17]. Although DHL and HL share the abovementioned commonalities, they are 2 distinct constructs. Whereas HL focuses on individuals' ability to access, understand, appraise, and apply health information, DHL extends these competencies to digital contexts by incorporating the knowledge and skills required to effectively engage with digital technologies. This includes competencies related to navigating digital environments, evaluating online information, protecting privacy and safety, and using digital health services and interactive technologies [18,19].

DHL plays a key role regarding health and the capacity to act within our societal structures and processes—and it can therefore be seen as a central prerequisite for a meaningful life and participation in modern society [16,20,21]. However, studies conducted in Portugal, Germany, and the United States found that individuals tended to experience difficulties in dealing with digital health–related information [22-24]. In the Portuguese study, more than half of the respondents (N=1247, 52.7%) reported limited DHL [22], while in a panel study conducted in the United States, 57% (N=256) of respondents reported finding DHL tasks quite easy. In Germany, the proportion of the population with limited DHL was even higher (N=1996, 75.8%) [25]. In contrast, in Austria, only 30% of the population reported difficulties in dealing with digital health–related information [26]. In light of the great differences regarding DHL in the neighboring countries, it is unclear what the level of DHL in Switzerland is, what the determining factors and consequences are, and where there is urgent need for action. Furthermore, little is known about which population groups are particularly affected by low DHL in Switzerland. In addition, although the use of health-related digital sources has been investigated in other studies in Switzerland [27-29], so far, data regarding the relation between DHL and the use of different health-related information sources in Switzerland are lacking.

Consequently, the aim of this study was to investigate DHL in Switzerland and to identify potential need for action. In addition, the study aimed at investigating potential associations between DHL and the use of diverse sources for health information. Accordingly, the following research questions were addressed:

1. What is the current state of DHL among the adult resident population in Switzerland?
2. What are the sociodemographic characteristics associated with DHL? Which population groups are particularly affected by low DHL?
3. What are the health-related consequences of DHL among the adult resident population in Switzerland?
4. Are there differences in the use of health information sources in relation to the level of DHL?

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Methods

Overview

The survey on DHL among the population living in Switzerland was embedded in the national Health Literacy Survey Switzerland (HLS_{19-21}-CH) [30]. This study, in turn, was part of the overarching European study, Health Literacy Survey 2019-2021 (HLS_{19}), a project of the World Health Organization (WHO) Action Network on Measuring Population and Organizational Health Literacy (M-POHL), aiming to collect cross-national data on populations' HL in 17 member states of the WHO European Region [31]. Within this European project, DHL was one of several optional modules for the participating countries to choose and to gain more in-depth insights into a specific area of HL.

Questionnaire

Questionnaire Development

The questionnaire to assess DHL in the adult population living in Switzerland was developed in English by a specific working group of the HLS_{19} [32,33]. For this study, the English questionnaire was translated by professional translators into German, French, and Italian. All 3 language versions were proofread by experts of the respective language and by members of the M-POHL network in Germany, France, and Italy, and were pretested in the 3 language regions in Switzerland.

DHL

The respective instrument HLS_{19}-DIGI contains 8 items measuring DHL in general adult populations. Respondents are asked to assess on a 4-point Likert scale varying between "very easy" and "very difficult," how easy or difficult they experience 8 tasks when dealing with digital health information: (1) to use the proper words or search query to find the information one is looking for, (2) to find the exact information they are searching for, (3) to understand the information, (4) to judge whether the information is reliable, (5) to judge whether the information is offered with commercial interests, (6) to visit different websites to check whether they provide similar information about a topic, (7) to judge whether the information is applicable to them, and (8) to use the information to help solving a health problem. Additionally, the use of digital sources is measured by 6 items and asks respondents how often in a typical week they use (1) digital health devices, (2) health apps on their phones, (3) websites, (4) social media, (5) other digital offers related to health, and (6) digital interactions with health care providers [33]. For this part, the following response categories can be chosen: "not relevant for me," "less than once per week," "1-3 days per week," "4-6 days per week," "once a day," or "more than once per day."

Sociodemographic Characteristics

The instrument also comprises questions investigating participants' sociodemographic characteristics and presence of chronic diseases. For the analysis, 2 specific indices are created. The first index measured financial deprivation and was constructed in accordance with the M-POHL recommendations [32]. It was based on three items measuring the perceived ease or difficulty of (1) paying bills at the end of the month, (2) being able to afford medication when needed, and (3) being able to afford medical examinations and treatments. The 3 items reflect financial constraints relating to everyday life and health, combining general end-of-month financial hardship with health-specific barriers [32]. The second index measures the level of social support and is based on the Oslo Social Support Scale (OSSS-3) [34], calculated based on the items about (1) the number of supportive people, (2) the involvement of other people in one's own life, and (3) the difficulty of getting practical help from neighbors.

Calculation of the DHL Score

Based on the 8 items of the questionnaire on DHL, a score (HL-DIGI [digital health literacy score]) was calculated. The calculation of the score followed the 4 rules proposed by the M-POHL network [32]: (1) any question for which a participant did not provide a response was treated as missing and excluded from the analysis; (2) if the answer to a question was "very easy" or "easy," 1 point was added; for "very difficult" or "difficult," no point was added, resulting in a sum between 0 and the total number of questions (8); (3) the sum of the points was divided by the number of (not ignored) questions, resulting in a rational number between 0 and 1; and finally (4) the number was multiplied by 100. This resulted in a rational number between 0 and 100, whereby a higher score indicates a higher level of DHL. Thus, the calculation of the DHL score was based on the following formula:

$$\text{HL}-\text{DIGI} = 100 \times \frac{\text{number "(very) easy"}}{\text{number of questions}}$$

In accordance with the international standards of the M-POHL network, scores were calculated only when a minimum of 80% of the items contained valid responses. Internal consistency of the HL-DIGI was high (Cronbach α=0.85) [32]. For comparability and easier comprehensibility, the HL-DIGI results were categorized into 4 categories: "inadequate," "problematic," "sufficient," and "excellent." The categorization was based on the cutoff points defined by the M-POHL network [32] and used for calculating the categorical levels of the HLS_{19}-Q12 (ie, an adapted short form of the general HL instrument with 47 items).

Sample and Data Collection

Data collection was carried out by the survey institute MIS Trend on behalf of the Swiss Federal Office of Public Health (FOPH) and in collaboration with the Center for Health Literacy of the Careum Foundation. For data collection, a stratified, multistage random sampling strategy was used. First, sampling was stratified across the 26 Swiss cantons. Subsequently, participants were selected within strata defined by age and gender to ensure a representative distribution of the Swiss adult population. Addresses were drawn from the sample frame of the Federal Statistical Office (FSO) to ensure a representative sample of the adult population permanently resident in Switzerland. For this study, 4764 addresses of adults (≥ 18 years old) living in Switzerland were drawn from the sample frame and invited by postal invitation to participate in the study. Individuals younger than 18 years of age and those unable to complete the survey in 1 of the 3 available survey languages

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were not eligible to participate. Data collection took place between March 5 and April 29, 2020.

Statistical Analysis

The statistical data analysis was conducted by the market research institute gfs.bern in close collaboration with the Center for Health Literacy of the Careum Foundation. For the statistical analysis, the IBM SPSS v.27 software was used. The distribution of the HL-DIGI score was determined visually using quantile-quantile plots and was considered approximately normal (skewness=–0.174; kurtosis=–1.157). Based on this assessment, parametric tests were considered appropriate for analyses involving the HL-DIGI score. To enhance representativeness, weighting was applied to align the sample with the resident population in Switzerland. Following the recommendations of the M-POHL [32], weights were generated using official population statistics from the Swiss FSO, including Population and Households Statistics (STATPOP, 2020) and the Structural Survey (2020) and calibrated to the marginal distributions of sex (female and male), age group (18-39, 40-64, and ≥65), population density (urban, intermediate, and rural), education, and administrative regional units (NUTS-3, 26 cantons). Descriptive statistical analysis was used to describe the sample's characteristics, to analyze the frequencies of the DHL items, as well as to describe the DHL levels among the population. To investigate associations of DHL with sociodemographic characteristics and the health-related consequences, Pearson chi-square test and Spearman rank correlation coefficient were used. To identify factors independently associated with DHL while controlling for potential confounding, multivariable linear regression analyses were performed. Models were adjusted for sex, age, education, education in the health sector, financial deprivation, monthly household income, self-reported social status, migration background, social support, and presence of chronic illnesses. Difficulties with the local language were not included in the primary multivariable regression model because this variable was only collected among participants with a mother tongue different from a national language. Effect estimates are reported with 95% CIs, using unstandardized regression coefficients (B) for linear regression models and odds ratios (ORs) for logistic regression models. For analysis purposes, the response category "I don't know" was interpreted as a missing value.

Ethical Considerations

Ethical review and approval were not required for this study in accordance with Swiss legislation and institutional requirements. The study involved the collection and analysis of anonymized data only and therefore did not fall within the scope of the Swiss Human Research Act (HRA [35]). Under Swiss law, research based exclusively on anonymized health-related data is not subject to the HRA and does not require review by a cantonal ethics committee.

Written informed consent was not required under applicable legislation and institutional requirements. Nevertheless, participants were provided with detailed information about the study at the beginning of the survey and were required to confirm their informed consent electronically before proceeding with the questionnaire.

Results

Overview

A total of 2554 individuals took part in the study, which corresponds to a response rate of 53.6%. Data were collected mainly by means of computer-assisted online interviews (CAWIs, in 2312 cases), while 190 interviews were conducted by means of computer-assisted telephone interviews (CATIs). A total of 2502 participants met the overall study inclusion criteria of having completed at least 80% of the items of the General Health Literacy scale. Consequently, 52 respondents were excluded from the final analyses due to insufficient item completion, resulting in a total of 2502 valid responses. Further, in accordance with the M-POHL recommendations [32], DHL scores were computed only for respondents who completed at least 80% of the relevant items, resulting in n=2334. Consequently, 168 participants from the overall study sample were excluded from the calculation of the HL-DIGI score because of insufficient completion of the DHL items. Analyses of individual DHL items were based on all available responses from the overall study sample (N=2502), with the number of valid responses varying by item due to missing data.

Sample Characteristics

The data for this study were analyzed for a total of 2502 participants. Slightly more females participated in the survey. Most respondents were in the age range between 40 and 64. A detailed description of the sociodemographic characteristics can be found in Table 1.

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Table 1. Sociodemographic characteristics of the sample (N=2502)[a].

Sample characteristics	Value, n (%)
Sex	
Female	1280 (51.2)
Male	1219 (48.7)
Age (years)	
18-39	767 (30.7)
40-64	1160 (46.4)
≥ 65	571 (22.8)
Education	
Primary school or secondary school level I	325 (13)
Secondary school	1197 (47.8)
Bachelor's degree or equivalent	649 (25.9)
Master's degree or equivalent or Doctorate	324 (12.9)
Migration background	
Yes	1041 (41.6)
No	1449 (57.9)
Difficulties with national languages[b]	
Very easy	289 (50.1)
Easy	189 (32.8)
Difficult or very difficult	99 (17.1)
Type of settlement	
Rural	438 (17.5)
Intermediate	557 (22.3)
City	1507 (60.2)
Self-reported social status	
Very low	158 (6.3)
Low	162 (6.5)
Lower intermediate	553 (22.1)
Intermediate	449 (17.9)
Upper intermediate	416 (16.6)
High	241 (9.6)
Very high	79 (3.2)
Financial deprivation	
None	1337 (55)
Low	410 (16.4)
Middle	302 (12.1)
High	413 (16.5)
Chronic illnesses	
Yes, one	682 (27.3)
Yes, more than one	246 (9.8)
No	1570 (62.7)
Education in the health sector	

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Sample characteristics	Value, n (%)
Yes	467 (18.7)
No	2034 (81.3)
Social support (Oslo Social Support Scale)	
Weak	439 (17.5)
Moderate	1252 (50)
Strong	797 (31.9)

[a]The total n and % can differ from N=2502 or %=100 due to missing values.

[b]Only among people with a mother tongue different from a national language (n=577).

Distribution of DHL

Almost three-quarters of the population living in Switzerland have low DHL (mean 55.7, SD 33.0), most of them showing inadequate (1034/2334, 44.3%) or problematic (651/2334, 27.9%) levels. 21% (491/2334) of the respondents reported sufficient, and 6.8% (159/2334) excellent DHL levels.

The 8 items of DHL show variation in the stated difficulty of the demands (Table 2). Most difficulties were reported for the 3 tasks “to judge whether the information is reliable” (item 4, 1552/2352, 66% [very] difficult), “to judge whether the information is offered with commercial interests” (item 5, 1481/2343, 63.2%), and “to use the information to help solve a health problem” (item 8, 1231/2336, 52.7%). In contrast, most of the respondents found it (very) easy “to use the proper words or search query to find the information they are looking for” (item 1, 1810/2369, 76.4%), “to visit different websites to check whether they provide similar information about a topic” (item 6, 1666/2335, 71.3%) and “to understand the information” (item 3, 1673/2356, 71%).

Table 2.

Item	How easy or difficult is it ...	Very easy, n (%)	Easy, n (%)	Difficult, n (%)	Very difficult, n (%)
1	to use the proper words or search query to find the information they are looking for? (n=2369)	462 (19.5)	1348 (56.9)	448 (18.9)	111 (4.7)
2	to find the exact information they are searching for? (n=2358)	234 (9.9)	1170 (49.6%)	774 (32.8)	180 (7.6)
3	to understand the information? (n=2356)	281 (11.9)	1392 (59.1)	573 (24.3)	110 (4.7)
4	to judge whether the information is reliable? (n=2352)	129 (5.5)	671 (28.5)	1161 (49.4)	391 (16.6)
5	to judge whether the information is offered with commercial interests? (n=2343)	163 (7)	700 (29.9)	1102 (47)	379 (16.2)
6	to visit different websites to check whether they provide similar information about a topic? (n=2335)	335 (14.3)	1331 (57)	538 (23)	132 (5.7)
7	to judge whether the information is applicable to them? (n=2345)	157 (6.7)	994 (42.4)	998 (42.5)	197 (8.4)
8	to use the information to help solve a health problem? (n=2336)	149 (6.4)	955 (40.9)	994 (42.6)	237 (10.1)

[a]The total n and % can differ from N=2502 because of missing values.

DHL and Sociodemographic Characteristics

Descriptively, inadequate DHL was more frequently reported by people older than 65 years (229/424, 54.1%), those with lower education (145/292, 49.5%), people without an education in the health sector (884/1874, 47.1%), those experiencing high financial deprivation (223/404, 55.1%), people with low or very low social status (92/162, 56.8% and 77/155, 49.4%), and low social support (218/425, 51.3%). Although people with a migrant background report inadequate DHL less often than natives (435/1032, 42.2% vs 590/1289, 45.8%), people with difficulties with the national language spoken at their place of residence also tend to have more difficulties dealing with digital health information and services; that is, they report inadequate DHL more often (55/96, 57.3%).

Bivariate correlations between the sociodemographic characteristics and DHL were rather weak. The largest correlations with HL-DIGI were observed for age (ρ=–0.147), education in the health sector (ρ=0.134), and self-reported social status (ρ=0.133). Further correlations were found with education (ρ=0.133), migration background (ρ=0.077), social support (ρ=0.121), financial deprivation (ρ=–0.117), difficulties with the local language (ρ=–0.123), and the presence of chronic illnesses (ρ=–0.115).

A multivariable linear regression analysis identified several sociodemographic characteristics independently associated with DHL (Table 3). The overall model explained 9.2% of the variance in DHL (R^2=0.092; adjusted R^2=0.082). Older age was associated with lower DHL (B=−0.278, 95% CI −0.371 to

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−0.185), as was greater financial deprivation (B=−0.101, 95% CI −0.148 to −0.054). Compared with participants with a master's degree or higher, lower DHL scores were observed among those with primary education (B=−9.199, 95% CI −15.187 to −3.211), secondary education (B=−7.667, 95% CI −12.236 to −3.099), and a bachelor's degree (B=−8.788, 95% CI −13.440 to −4.136). In contrast, education in the health sector was associated with higher DHL (B=11.337, 95% CI 7.720 to 14.953), as well as greater social support (B=1.109, 95% CI 0.308 to 1.909). Participants without a migration background had lower adjusted DHL scores than those with a migration background (B=−5.992, 95% CI −8.990 to −2.994).

Table 3. Multivariable linear regression analysis between digital health literacy score and sociodemographic characteristics.

HL-DIGI[a] and sociodemographic characteristics	Adjusted B (95% CI)
Sex	
Male	1.961 (−0.932 to 4.853)
Female	Reference
Age (years)	–0.278 (–0.371 to –0.185)
Education	
Primary school	−9.199 (−15.187 to −3.211)
Secondary school	−7.667 (−12.236 to −3.099)
Bachelor's degree	−8.788 (−13.440 to −4.136)
Master's degree or higher	Reference
Education in the health sector	
Yes	11.337 (7.720 to 14.953)
No	Reference
Financial deprivation	–0.101 (–0.148 to –0.054)
Monthly household income (CHF)[b]	
<4000	4.380 (−2.741 to 11.500)
4000-6000	−0.766 (−7.630 to 6.099)
6000-8000	−4.881 (−11.805 to 2.044)
8000-10,000	−1.766 (−8.875 to 5.343)
10,000-12,000	−8.925 (−16.534 to −1.317)
12,000-14,000	−3.762 (−12.383 to 4.859)
>14,000	Reference
Self-reported social status	1.455 (0.347 to 2.562)
Migration background	
No	–5.755 (–8.996 to –2.514)
Yes	Reference
Social support	1.109 (0.308 to 1.909)
Presence of chronic illnesses	
Yes, more than one	−4.654 (−9.569 to 0.261)
Yes, one	−2.675 (−5.970 to 0.621)
No	Reference

[a]HL-DIGI: digital health literacy score.

[b]The average exchange rate in March 2020 was CHF 1=US $1.045

For monthly household income, estimates for most categories were imprecise and their 95% CIs included zero when compared with an income above CHF 14,000 (CHF 1=US $1.045). The estimates for having one chronic illness (B=−2.675, 95% CI −5.970 to 0.621) or more than one chronic illness (B=−4.654, 95% CI −9.569 to 0.261), relative to having no chronic illness, also had CIs that included zero.

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Health-Related Consequences of DHL

DHL was significantly associated with several health-related outcomes, including self-assessed general health status, self-management, that is, ability to deal with one or more chronic diseases or other health problems, limitations of everyday activities due to health problems, use of emergency services during the past 24 months, physician visits within the last 12 months, and absences from work due to health problems in the last 12 months.

After adjustment for relevant covariates, higher DHL was associated with better self-reported health status (OR 1.005, 95% CI 1.003-1.007) and fewer difficulties in dealing with chronic diseases or health problems (OR 0.989, 95% CI 0.984-0.993). Higher DHL was also associated with lower likelihood of experiencing restrictions of usual activities due to health problems (OR 1.004, 95% CI 1.001-1.007). Associations with absence from work due to health problems (B=−0.003, 95% CI −0.024 to 0.017), BMI (B=0.002, 95% CI −0.005 to 0.008), physician visits in the last 12 months (B=−0.004, 95% CI −0.008 to 0.001), specialist visits in the last 12 months (B=−0.002, 95% CI −0.007 to 0.003), inpatient hospitalization (B=0.000, 95% CI −0.001 to 0.001), and use of emergency services (B=−0.003, 95% CI −0.007 to 0.000) were small, with CIs that included or approached the null value (Table 4).

Table 4. Adjusted associations between digital health literacy score and health-related consequences.

Health-related consequences	Regression model	Adjusted estimate for DHL[a] (95% CI)
Self-assessed general health status	Ordinal logistic	1.005[b] (1.003 to 1.007)
Difficulties in dealing with chronic diseases or health problems	Ordinal logistic	0.989[b] (95% CI 0.984 to 0.993)
Restriction of usual activities due to health problems	Binary logistic	1.004[b] (95% CI 1.001 to 1.007)
Absence from work due to health problems in the last 12 months	Linear	–0.003[c] (–0.024 to 0.017)
BMI	Linear	0.002[c] (–0.005 to 0.008)
Visits to the physician in the last 12 months	Linear	–0.004[c] (–0.008 to 0.001)
Visits to specialists in the last 12 months	Linear	–0.002[c] (–0.007 to 0.003)
Inpatient hospitalization in the last 12 months	Linear	0.000[c] (–0.001 to 0.001)
Use of emergency services in the last 24 months	Linear	–0.003[c] (–0.007 to 0.000)

[a]DHL: digital health literacy.

[b]Odds ratio value.

[c]Unstandardized regression coefficient value.

Estimates represent associations with HL-DIGI adjusted for gender, age, education, education in the health sector, financial deprivation, monthly household income, self-reported social status, migration background, social support, and the presence of chronic illnesses. ORs are reported for ordinal and binary logistic regression models and unstandardized regression coefficients (B) for linear regression models.

Use of Digital Resources as Sources of Health-Related Information

Most of the respondents reported that they generally do not use digital resources when searching for health-related information. The use of websites, however, represented an exception, with only 25% (645/2502) reporting not using them for this purpose. Among respondents using digital resources for searching health-related information, most reported using them less than once a week across all digital resource types (Table S1 in Multimedia Appendix 1).

Use of Health Information Sources According to DHL

The use of health information sources differed across DHL levels (Table 5). Across all DHL levels, digital sources were the most frequently reported source of health information. However, their use decreased with increasing DHL, from 56.1% among participants with inadequate DHL to 46.2% among those with excellent DHL. Individuals with higher DHL levels tend to rely more on face-to-face information from health care professionals or written documents than their counterparts. The use of laypersons, naturopaths or alternative medicine specialists, and hotlines as sources of health information remained uncommon across all DHL groups.

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Table 5. Use of health information sources in relation to digital health literacy[a].

Health information sources	Inadequate (n=924), %	Problematic (n=600), %	Sufficient (n=434), %	Excellent (n=136), %	Total (n=2094), %
Written documents	54 (5.9)	32 (4.9)	32 (7.6)	20 (14.7)	138 (6.5)
Laypersons	43 (5)	25 (4.2)	13 (3)	4 (3.5)	85 (4.2)
Physicians or other health professionals	260 (27.5)	137 (22)	125 (29.5)	45 (32.9)	567 (26.7)
Naturopaths or alternative medicine specialists	44 (4.3)	20 (4.4)	19 (4.6)	3 (2.1)	86 (4.2)
Hotline	11 (1.2)	8 (1.5)	1 (0.2)	1 (0.7)	21 (1)
Digital sources	512 (56.1)	378 (63)	244 (55.1)	63 (46.2)	1197 (57.3)

[a]n is the unweighted number of cases. The analyses were based on participants with sufficient data for both DHL and use of health information sources (n=2094). Of the 2334 participants included in the DHL analyses, 240 had missing data on the variables required for this analysis and were therefore excluded.

Discussion

Principal Results

DHL plays a central role for people's participation in health-related decisions [16,20,21]. This study delivers first-time quantitative data about DHL among the adult population in Switzerland, the population groups that are particularly affected by low DHL, the health-related consequences of low DHL, as well as the use of health information sources in relation to the level of DHL.

These findings indicate that the average DHL of the population living in Switzerland is low, with most respondents reporting either inadequate (44.3%) or problematic (27.9%) DHL levels. Other studies, especially in Europe, also report frequent inadequate or problematic DHL levels among the population, but with partly different results. The results of the European studies range from 66.4% inadequate and 9.4% problematic DHL in Germany [24] to 27.7% inadequate and 25% problematic DHL in Portugal [22]. Thus, the results of the Swiss population can be classified between these countries. However, although all 3 countries used the same DHL questionnaire as part of the HLS_{19} study, some methodological differences may partly explain the observed variations in the findings. In Germany, data were collected using paper-and-pencil interviews (PAPIs) between December 2019 and January 2020 [24], whereas in Portugal, data collection was conducted using CATI between December 2020 and January 2021 [22]. In addition to differences in survey mode, the surveys were conducted at different stages of the COVID-19 pandemic, which may have influenced participants' information-seeking behaviors and DHL. In addition, this study shows that most difficulties are reported regarding judging whether the information is reliable, as well as whether there are commercial interests behind the information. Moreover, applying the information to solve a health problem was difficult for most respondents. Also, in other studies from Switzerland, Portugal, Germany, and Austria [22,24,26,36], appraising and applying digital health information were found to pose great difficulties for people. Focusing on Switzerland, this was particularly evident during the COVID-19 pandemic [7]. Thus, in the modern era characterized by digital transformation and the broad and quick spread of information and misinformation, individuals' capability to critically appraise information and distinguish reliable from misleading information plays a vital role in making sound decisions for their health and well-being. This study, however, shows that there is a huge need for supporting measures and a great demand to increase not only individuals' but, more generally, the population's DHL in order to protect and promote public health facing current and future societal developments.

In line with previous studies [33,37], DHL tends to follow a social gradient; likewise does general HL [22,38-40]. Similar to studies regarding general HL among different population groups [22,41,42], the findings of this study indicate that certain population groups are particularly affected by low DHL, namely people of older age, financial deprivation, lower self-reported social status, lower educational attainment, and difficulties with the local language. The findings also show that people with weak social support report low DHL more often compared to individuals with strong social support. Other studies investigating the sociodemographic characteristics associated with DHL [25,43,44] reported similar results, such as relations of low DHL with older age, lower educational level, and lower social status. Thus, these results highlight the importance of targeted interventions for strengthening DHL, particularly for at-risk population groups in Switzerland, especially older adults and people with low social support. Such interventions are urgently needed since already existing health inequities associated with older age, lower level of educational attainment, and lower socioeconomic status are likely to be increased by the spread of digital technologies [10].

In this study, individuals with adequate DHL levels reported higher general health status, better self-management, and fewer restrictions on everyday activities. These findings are in line with previous studies reporting that people with sufficient DHL tend to have a better health status [15,45,46]. These studies also found an association with shorter hospitalization durations and less frequent use of health care services, resulting in lower health care costs. According to a systematic review and meta-analysis, DHL was also positively correlated with health-related behaviors and healthy lifestyles [47]. Thus, the findings of this study, as well as those from previous studies, suggest that strengthening DHL of the population can be an effective measure for all 3 areas, that is, health care, prevention, and health promotion,

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leading to better public health outcomes and the potential to reduce the steady increase of health care costs [48].

The findings of this study show that individuals with higher DHL levels rely more on information from health care professionals as well as written records compared to people with lower DHL. Surprisingly, respondents with higher DHL levels use digital sources of health information less frequently than their counterparts. An explanation for this rather unexpected finding might be that individuals with higher DHL levels have a more reflective and critical approach when dealing with digital health information and tend to cross-check information across multiple sources. Consequently, they are less likely to rely uncritically on a single digital source when searching for health information [4,49,50]. In addition, individuals with higher DHL levels are more aware of the spread of misinformation and disinformation online [51] and tend to have higher trust in nondigital information sources [52]. In line with these findings, previous studies [53,54] highlighted how people with lower HL levels tend to use and trust digital sources such as social media and blogs more frequently. However, further interpretations of this unexpected finding should be considered. Data collection took place during the COVID-19 pandemic, the accompanying "infodemic" [11], and heightened media use that may have influenced how individuals sought and trusted online health information. In addition, a possible explanation for the observed association is residual selection bias. If participation in the study differed according to unmeasured characteristics related to both DHL and digital information-seeking behavior, the observed association may have been overestimated or underestimated. Although such possibilities should be considered when interpreting the findings, the results also suggest the importance of strengthening DHL among those using digital health information more often despite having more difficulties in dealing with it.

Limitations

This study is subject to certain limitations. First, data collection relied on self-reported difficulties. This might potentially have led to either an overestimation or an underestimation of respondents' levels of DHL. However, self-assessments have been the gold standard for HL measurement in large populations so far [32,55], and they offer important insights into potential problem areas concerning the handling of health-related information [56], making them suitable for the development of targeted interventions, as well as the aims of this study. A second limitation is posed by the languages used for the survey. Although the survey was translated into the 3 most-spoken national languages in Switzerland (ie, German, French, and Italian), other languages spoken by minorities were not covered due to limited resources. Therefore, the validity of the results for people who are experiencing difficulties with the local language may be limited. Since the findings of this study suggest that the difficulties with the local language are associated with lower DHL, the difficulties with digital health information among minority population groups deserve to be further investigated. Third, data were mainly collected by means of CAWI, which may have posed challenges for individuals with low digital skills and could have excluded some from participating in the survey. However, this limitation was partly mitigated by offering the possibility to participate by means of telephone interviews (CATI). This in turn posed another limitation. Indeed, different modes of survey administration may lead to mode effects, whereby participants respond differently depending on whether the questionnaire is self-administered (CAWI) or interviewer-administered (CATI). This in turn may affect the comparability of responses, even when a standardized questionnaire was used. Thus, future studies should balance the benefits of mixed-mode data collection, such as improved population coverage, against its potential drawbacks, including mode effects and reduced comparability of responses. Further, a response rate of 53.6% is common for population surveys. However, it introduces a potential selection bias. Although representativeness was enhanced through a stratified, multistage random sampling strategy and the weighting procedure, no formal nonresponse analysis was conducted. Therefore, the findings should be interpreted with appropriate caution when generalizing to the population. Another limitation is that the data for this study were collected between March 2020 and April 2020, that is, during the first wave of the COVID-19 pandemic in Switzerland. This period was, on the one hand, characterized by a broad spread of health information from digital and nondigital sources [11], as well as a heightened media use, and, on the other hand, it was defined by a special attention to health issues. In such times and circumstances, respondents might have perceived their own difficulties in dealing with (digital) health information differently than before the pandemic. Additionally, their use of digital health information sources may have differed from their usual information-seeking behavior under nonpandemic conditions. Thus, to monitor the DHL of the population based on the social and environmental changes, regular assessments of the population's DHL and, based thereon, the development of targeted improvement measures are needed.

Conclusions

The Swiss population generally reported low DHL, which was associated with poorer health status, more difficulties in self-management, and more restrictions of usual activities due to health problems. Thus, measures aimed at improving DHL of the population, with a special focus on the most vulnerable groups, are needed at a local, regional, and national level. Since HL and digital HL are relational concepts, interventions should not focus solely on individuals, but involve different actors and settings. A coordinated, multilevel approach involving local communities, educational institutions, health professionals and organizations, and policymakers is therefore needed.

The findings indicate that some population groups tend to have lower DHL and may require targeted support. Older people, for example, may be effectively reached through health professionals, who are often the first point of contact for patients and therefore play a central role in strengthening patients' DHL. To fulfil this role, health professionals need the necessary competencies and organizational support. Integrating HL and DHL into curricula, continuing professional education, and training of health professionals should therefore be prioritized. Health care organizations can further contribute by implementing clear communication standards and providing accessible digital services. Other vulnerable groups, such as

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people experiencing financial deprivation, with a migration background, or with limited social support, may be less easily reached through the health care system. Strengthening DHL therefore requires action beyond health care. The compulsory education system, for example, provides an ideal setting for developing DHL from an early age across all population groups. Embedding DHL within compulsory school curricula and teacher education can particularly benefit children from disadvantaged backgrounds, thereby contributing to greater social and health equity.

Although physicians and other health professionals were widely reported as sources of health information, digital sources were used most frequently across all DHL levels. Given that participants reported particular difficulties in assessing the reliability of digital health information and identifying commercial interests, greater efforts should be directed toward improving the quality of digital health information. Developing evidence-based quality standards and guidelines for the creation, dissemination, and maintenance of digital health information could help ensure that reliable information is easier for users to identify. In addition, transparent quality assurance mechanisms, such as certification systems or adherence to established best-practice criteria, could further support users in distinguishing reliable sources from misinformation.

Strengthening DHL requires a systematic, coordinated, and participatory multistakeholder approach. Such an approach potentially fosters equitable access to digital health information and services, positively enhances the quality of health care, and at the same time fosters public health in an increasingly digital society.

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Data Availability

The datasets generated and analyzed during this study are not publicly available because participants did not consent to their data being shared publicly.

Generative AI Use

The generative AI tools ChatGPT, Consensus AI, and Perplexity AI were used to support the literature search, data analysis, as well as the proofreading, drafting, and structuring of the manuscript.

Authors' Contributions

EA contributed to this study by contributing to data analysis and drafting the manuscript. RJ and ASB advised with regard to conceptualization and writing and contributed to the data analysis. SMDG was the project lead and supervised the conduct of the study, the coordination, the data analysis, as well as the writing process. All authors reviewed the manuscript and approved the final manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Use of digital devices as sources of health-related information.
[DOCX File , 22 KB-Multimedia Appendix 1]

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Abbreviations

CATI: computer-assisted telephone interview
CAWI: computer-assisted online interview
DHL: digital health literacy
FOPH: Federal Office of Public Health
FSO: Federal Statistical Office
HL: health literacy
HL-DIGI: digital health literacy score
HLS19: Health Literacy Survey 2019-2021
HLS19-21-CH: Health Literacy Survey Switzerland 2019-2021
HRA: Human Research Act
M-POHL: Measuring Population and Organizational Health Literacy
OR: odds ratio
OSSS-3: Oslo Social Support Scale
PAPI: paper-and-pencil interview
STATPOP: Population and Households Statistics
WHO: World Health Organization

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