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# Health Information Technologies in Diabetes Management

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## Commentary

About 1 in 11 adults worldwide now have DM, 90% of who have type 2 diabetes (T2D). Successful glycaemic control helps to prevent and reduce complications of T2D, including disorder, kidney disease, blindness, neuropathy, and limb amputation, and reduce death related to the disease. However, maintaining optimal glycemic control requires on-going monitoring and treatment, which can be costly and challenging. To reinforce diabetes management, the event of innovative self-care strategies is warranted. Advances in health information technologies (HITs) can have been introduced approaches that support effective and affordable health-care delivery and patient education. Technologies in the mobile, computer, e-mail, and Internet approaches have shown evidence in enhancing chronic disease management, suggesting great potential for diabetes management technologies. During this chapter, we provided a summary of the HITs in use for T2D management. We synthesized the foremost recent findings on HITs' effect in reducing HbA1c and managing complications, cardiovascular conditions, especially [1]. Further, we discussed limitations within the present research during this area and implications for future research. Last, we presented challenges of applying HITs in T2D management within the real-world context and suggested steps to maneuver forward. Diabetes is that the fastest growing chronic condition worldwide. The prevalence of people with type 2 diabetes (T2D) is growing in each country. Diabetes is additionally the seventh leading explanation for death within the planet. Around 1.6 million people died because of diabetes in 2016. Higher blood glucose levels also caused an extra 2.2 million deaths, by increasing the risks of cardiovascular and other complications like kidney disease, blindness, neuropathy, and limb amputation. Successful glycemic control can prevent and reduce these complications. However, to require care of optimal glycemic control requires on-going monitoring and treatment, which can be costly and challenging. Advances in health information technologies (HITs) have introduced approaches that support effective and affordable health-care delivery and education [2].

## The potential of HITs in chronic disease management

Diabetes is the fastest growing chronic condition worldwide. The prevalence of people with type 2 diabetes (T2D) is growing in each country. Diabetes is also the seventh leading cause of deaths in the world. Around 1.6 million people died due to diabetes in 2016. Higher blood glucose levels also caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other complications such as kidney disease, blindness, neuropathy, and limb amputation. Successful glycemic control can prevent and reduce these complications. However, to maintain optimal glycemic control requires on-going monitoring and treatment, which can be costly and challenging. Advances in health information technologies (HITs) have introduced approaches that support effective and affordable health-care delivery and education [3].

HITs may include a broad range of technologies, electronic tools, applications, or systems that provide patient care, information, recommendations, or services for promotion of health and health care. The advantages of using HITs in health care are well documented. They have the potential to empower patients and support a transition from a task during which the patient is that the passive recipient of care services to an active role during which the patient is informed, has choices, and is involved within the decision-making process [4]. A growing research attention has been given to guage HITs' impact on diabetes management, including the first management goal, glycemic status, and major complications like cardiovascular conditions. Previous reviews on this subject suggested that HITs have the potential to reinforce these disease outcomes. However, effect size is restricted to the foremost outcome; glycated haemoglobin (HbA1c) varied between studies with reported mean difference ranging from −0.20 to −0.57%. The synthesized findings from the most recent systematic reviews. They searched randomized control trials (RCTs) that studied the effect of HITs on HbA1c among medically underserved patients.

Many of review studies including those mentioned above have shed light on the effect of HITs in glycemic control. However, these studies often included limited number of trials, lack of adherence to standard quantitative methods, inadequate attention to heterogeneity across studies, lumped nonrandomized and randomized trials together into evaluation, mixed participants with type 1 or type 2 diabetes into analysis, or restricted searching criteria to a particular patient population or a specific type of HIT. To address these limitations and to verify if and how much HITs impact glycemic control, Yoshida and colleagues recently conducted a meta-analysis to examine the most current state of evidence from RCTs concerning the effect of HITs on HbA1c reduction among patients with T2D. From an analysis of 34 eligible studies (40 estimates) identified from multiple databases from January 1946 to December 2017, the study reported that introduction of HITs to standard diabetes treatment resulted in a statistically reduced HbA1c [5].

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## Conflicts of Interest

The author has no known conflicts of interested associated with this paper.

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**Table 1:** Socio-demographic characteristics of diabetes mellitus patients attending at Jimma University specialized hospital, Southwest Ethiopia, 2018.

| Characteristics | | Number | Percentage (%) |
|---|---|---|---|
| **Age** | 18-49 | 115 | 49% |
| | >49 | 160 | 58.10% |
| **Sex** | Male | 125 | 45.45% |
| | Female | 150 | 54.50% |
| **Marital status** | Single | 20 | 7.30% |
| | Married | 181 | 66% |
| | Divorced | 36 | 13% |
| | Widowed | 38 | 13.90% |
| **Religion** | Orthodox | 70 | 25.45% |
| | Muslim | 165 | 60% |
| | Protestant | 25 | 9.10% |
| | Catholic | 15 | 5.45% |
| **Residence** | Urbane | 238 | 86.50% |
| | Rural | 37 | 13.45% |
| **Occupation** | Governmental | 110 | 40% |
| | Non-governmental | 34 | 12% |
| | Hose wife | 67 | 24.40% |
| | Private business | 44 | 16.40% |
| | Other | 20 | 7.30% |
| **Ethnicity** | Oromo | 198 | 72% |
| | Amhara | 14 | 5.10% |
| | Tigray | 7 | 2.54% |
| | Wolayita | 30 | 11% |
| | Other | 26 | 9.45% |
| **Educational status** | No education | 78 | 28.30% |
| | primary education | 41 | 14.90% |
| | Secondary education | 18 | 6.54% |
| | Higher education | 138 | 50.20% |
| **Monthly income** | <1000 | 113 | 41.10% |
| | 1001-2000 | 65 | 23.60% |
| | 2001-3000 | 37 | 13.50% |
| | 3001-4000 | 31 | 11.30% |
| | >4000 | 29 | 10.50% |

**Table 2:** The prevalence of urine physical parameters of diabetes mellitus patients attending at Jimma University specialized hospital, Southwest Ethiopia, 2018.

| No. | Physical characteristics’ | | Number | Percentage (%) |
|---|---|---|---|---|
| 1 | Color | Colorless | 43 | 15.63% |
| | | Dark yellow | 124 | 45.10% |
| | | Clear red | 77 | 28% |
| | | Cloudy red | 31 | 11.30% |
| 2 | Transparency | Clear | 20 | 7.30% |
| | | Hazy | 44 | 16% |
| | | Cloudy | 98 | 36% |
| | | Turbid | 113 | 41.20% |
| 3 | Foam | Dark | 136 | 49.45% |
| | | Beer | 139 | 50.54% |
| 4 | Odor | Sweetie fruity | 146 | 53.10% |
| | | Aromatic | 20 | 7.30% |
| | | Pungent smile | 109 | 40% |

**Table 3:** The prevalence of urine chemical parameters of diabetes mellitus patients attending at Jimma University specialized hospital, Southwest Ethiopia, 2018.

| Variable | | Protein | | Glucose | | Ketone | |
|---|---|---|---|---|---|---|---|
| | | P % | N % | P % | N % | N % | P% |
| Age | ≤49 | 10(3.6) | 95(34.5) | 97(35.3) | 23(8.4) | 61(22.9) | 52(19) |
| | >49 | 30(10.9) | 140(51) | 91(33.1) | 64(23.3) | 39(14.9) | 123(44.7) |
| Sex | Male | 15(5.5) | 109(39.6) | 99(36) | 29(10.54) | 84(30.5) | 24(8.7) |
| | Female | 25(9.1) | 126(45.8) | 89(32.36) | 58(21.1) | 16(58.9) | 151(57.1) |
| TDM | Type 1 | 10(3.6%) | 110(40) | 60(21.8) | 18(6.54) | 82(29.8) | 37(13.5) |
| | Type 2 | 30(10.9%) | 125(45.5) | 128(46.54) | 69(25.1) | 18(6.5) | 138(50.9) |
| FHDM | Yes | 17(6.2) | 135(49.1) | 24(8.72) | 28(10.9) | 42(15.3) | 21(7.6) |
| | No | 23(8.4) | 100(36.4) | 164(59.6) | 59(21.45) | 58(21.1) | 154(56) |
| ALC | Yes | 13(4.7) | 59(21.5) | 31(11.27) | 34(12.4) | 9(3.4) | 19(6.9) |
| | No | 27(9.8) | 176(64) | 157(57.1) | 53(19.3) | 91(33.1) | 156(56.7) |
| HT | Present | 15(5.5) | 54(19.6) | 93(33.8) | 21(7.6) | 22(8) | 78(28.4) |
| | Absent | 25(9.1) | 181(65.8) | 95(34.54) | 66(24) | 78(28.4) | 97(35.3) |
| SBP | <140 | 31(11.3) | 45(16.4) | 147(53.5) | 71(25.8) | 87(31.6) | 105(38.2 |
| | ≥140 | 9(3.27) | 190(69.1) | 41(15) | 16(5.8) | 13(4.7) | 70(25.5) |
| DBP | <90 | 21(7.6) | 172(62.5) | 138(50.9) | 65(23.6) | 94(34.2) | 111(40.4) |
| | ≥90 | 19(6.9) | 63(22.9) | 50(18.9) | 22(8) | 6(2.2) | 64(23.3) |
| BG | ≤130 | 22(8) | 100(36.4) | 74(27) | 19(69.1) | 14(5.1) | 59(21.5) |
| | >130 | 18(6.5) | 135(49.1) | 114(41.5) | 68(24.7) | 86(31.3) | 116(42.2) |
| BMI | <25 | 5(1.8) | 159(57.8) | 117(42.5) | 55(20) | 93(33.8) | 44(16) |
| | 25-29.9 | 20(7.3) | 47(17.1) | 53(19.3) | 18(6.54) | 5(1.8) | 70(25.5) |
| | ≥30 | 15(5.5) | 29(10.5) | 18(6.54) | 14(50.9) | 2(0.3) | 61922.2) |

**Table 4:** Microscopic result of diabetes mellitus patients attending at Jimma University Medical Center, Southwest Ethiopia, 2018.

| Variable | | Bilirubin | | Urobilinogen | | Leucocytes esterase | | Nitrite | |
|---|---|---|---|---|---|---|---|---|---|
| | | P % | N % | P % | N % | P% | N% | P% | N% |
| Age | ≤49 | 25(9.1) | 169(61.5) | 34(12.4) | 98(35.3) | 64(23.3) | 53(19.3) | 32(11.6) | 124(45.1 |
| | >49 | 39(14.2) | 42(15.3) | 45(16.4) | 48(17.5) | 91(33.1) | 67(24.4) | 43(15.6) | 76(27.6) |
| Sex | Male | 23(8.4) | 153(55.6 | 29(10.5) | 117(42.5 | 47(17.1) | 81(29.5) | 53(19.3) | 67(24.4) |
| | Female | 41(14.9) | 58(21.1) | 50(18.2) | 29(10.5) | 108(39.3 | 39(14.2) | 22(8) | 133(48.4 |
| TDM | Type 1 | 19(6.9) | 120(43.6 | 33(12) | 88(32) | 28(10.2) | 56(20.4) | 34(12.4) | 122(44.4 |
| | Type 2 | 45916.4) | 91(33.1) | 46(16.7) | 68(24.7) | 127(46.2 | 64(23.3) | 41(14.9) | 78(28.4) |
| FHDM | Yes | 21(7.6) | 135(48.7 | 21(7.6) | 98(35.6) | 18(6.5) | 31(11.3) | 23(8.4) | 145(52.3 |
| | No | 43(15.6) | 77(28) | 58(21.1) | 48(17.5) | 137(49.8 | 99(36) | 52(18.9) | 55(20) |
| ALC | Yes | 41(14.9) | 89(32.4) | 18(6.5) | 56(20.4) | 11(4) | 101(36.7 | 36(13.1) | 110(40) |
| | No | 23(8.4) | 122(44.4 | 61(22.2) | 90(32.7) | 144(52.4 | 19(6.9) | 39(14.2) | 90(32.7) |
| HT | Present | 17(6.2) | 130(47.3 | 34(12.4) | 59(21.5) | 59(21.5) | 42(15.3) | 27(9.8) | 132(48) |
| | Absent | 47(17.1) | 81(29.5) | 45(16.4) | 87(31.6) | 96(34.9) | 78(28.4) | 48(17.5) | 68(24.7) |
| SBP | <140 | 43(15.6) | 107(40) | 52(19) | 109(38.5 | 88(32) | 47(17.1) | 19(6.9) | 145(52.3 |
| | ≥140 | 21(7.6) | 104(37.8 | 27(9.8) | 37(13.5) | 67(24.4) | 73(26.5) | 56(20.4 | 55(20) |
| DBP | <90 | 18(6.5) | 139(50.5 | 23(8.4) | 99(36) | 97(35.3) | 91(33.1) | 57(20.3) | 80(29.1) |
| | ≥90 | 46(16.7) | 72(26.2) | 56(20.4) | 47(17.1) | 58(21.1) | 29(10.5) | 18(6.5) | 120(43.6 |
| BG | ≤130 | 39(14.2) | 100(36.4 | 34(12.4) | 63(22.9) | 44(16) | 56(20.4) | 33(12) | 79(28.7) |
| | >130 | 25(9.1) | 111(40.4 | 45(16.4) | 83(30.2) | 111(40.4 | 64(23.3) | 42(15.3) | 121(44) |
| BMI | 5 | 23(8.4) | 32(11.4) | 47(17.1) | 30(11) | 76(27.6 | 66(24 | 42(15.3) | 27(9.8) |
| | -29.9 | 22(8) | 80(29.1) | 26(9.5) | 45(16.4) | 60(21.8 | 42(15.3 | 21(7.6) | 64(23.3) |
| | ≥30 | 19(6.9) | 99(36) | 6(2.2) | 71(25.8) | 19(6.9 | 12(4.4 | 12(4.4) | 109(39.6) |