Mobile health as a primary mode of intervention for women at risk of, or diagnosed with, gestational diabetes mellitus

Edwards, KJ

http://hdl.handle.net/10026.1/19189

10.11124/jbies-21-00294
JBI Evidence Synthesis
Lippincott, Williams & Wilkins

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<table>
<thead>
<tr>
<th>mHealth name, type and country</th>
<th>mHealth intervention features</th>
<th>Evaluation method(s)</th>
<th>Implementation setting</th>
<th>Behavior Change Theory and No. of BCTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During pregnancy</strong></td>
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</tbody>
</table>
| Self-management for BGC<sup>a</sup> | Pregnant + App (Norway) | - Auto upload of BG<sup>b</sup> readings  
- Real-time visualization of BG levels  
- Information on healthy diet, PA<sup>c</sup> and diabetes | Development and usability<sup>34</sup>  
Evaluation (RCT)<sup>d</sup><sup>30</sup>  
Evaluation (qualitative)<sup>j</sup><sup>55</sup> | Hospital setting (at diagnosis) | Health Belief Model 5 |
| GDmHealth App (UK) | - Auto upload of BG readings  
- Real-time feedback on BG levels  
- Two way communication with HCP<sup>e</sup> | Development and usability<sup>46</sup>  
Pilot study<sup>43</sup>  
Pilot study<sup>38</sup>  
Evaluation (RCT)<sup>f</sup><sup>45</sup> | Hospital setting (at diagnosis) | 3 |
| Glucose Buddy App (Israel) | - Manual BG level upload  
- BG reports emailed direct to HCP via app  
- Feedback on BG levels, diet, treatment and appointments emailed to women  
- Two way interaction with HCP | Evaluation (RCT)<sup>i</sup><sup>47</sup> | Hospital setting (at diagnosis) | 3 |
| dNurse App (China) | - Manual upload of BG readings  
- Real-time feedback on BG levels  
- Two way connections with HCP  
- Information on diet, exercise and treatment | Evaluation (RCT)<sup>k</sup><sup>36</sup> | Hospital setting (at diagnosis) | 4 |
| DiaMOnd App (Australia) | - Manual upload of BG readings  
- Real-time feedback from HCP on BG diet, | Evaluation (cross over trial)<sup>58</sup> | Private Hospital setting (at diagnosis) | 3 |
<table>
<thead>
<tr>
<th>App</th>
<th>Features</th>
<th>Evaluation</th>
<th>Setting</th>
<th>Count</th>
</tr>
</thead>
</table>
| GlucoseMamma App (USA) | - Manual upload of BG readings  
- Real-time feedback on BG levels  
- Positive text messaging  
- Information on healthy eating, recipes and meal plans | Evaluation (prospective RCT)\textsuperscript{32} | Hospital setting (at diagnosis) | 2 |
| GEM App (Russia) | - Auto upload of BG readings  
- Logs dietary intake  
- Personalized advice on upcoming meals based on BG readings | Pilot study (mixed methods)\textsuperscript{51} | N/A | 2 |
| Mother App (Australia) | - Manual BG level upload  
- BG levels viewed by HCP via online portal | Pilot study\textsuperscript{57} | Hospital setting (at diagnosis) | 2 |
| Net Health App (Australia) | - Auto upload of BG readings  
- Two way interaction with HCP  
- Auto alert to HCPs if BG levels are out of range | Trial registration (pilot Non-RCT)\textsuperscript{50} | Hospital setting (at diagnosis) | 3 |
| App (Korea) | - Auto upload of BG readings  
- Two way communication with HCP  
- Records dietary intake  
- Tailored in-app messaging | Pilot study (Pilot RCT)\textsuperscript{56} | Hospital setting (at diagnosis) | 3 |
| App ecosystem (New Zealand) | - Food diaries, exercise tracking, glucose monitoring  
- Ability to export data to HCP | Pilot study (qualitative) | N/A | 1 |
|-----------------------------|-------------------------------------------------|------------------------|-----|----|
| App (Oman)                  | - Health education and videos on PA, BG monitoring and diet  
- Tracks PA, diet and BG  
- Provides feedback charts  
- Daily reminders to monitor BG | Trial registration (feasibility RCT) (SESSPA) | Hospital setting (at diagnosis) | 7 |
| MobiGuide App (Spain)       | - Auto upload of BG readings  
- Two way interaction with HCP via messaging  
- tracks PA via embedded accelerometer | Pilot study (observational, prospective) | Hospital setting (at diagnosis) | 2 |
| App (South Korea)           | - Generates generic and tailored recommendations on BG management, PA, bodyweight and diet based on patient data and clinical guidelines | Development and usability (mixed methods) | Online diabetes group (at home) | 2 |
| Education Educational App (Iran) | - Reminders for tests and medication  
- Educational material in video photo and text format | Evaluation (quasi-experimental with control) | Hospital setting (at diagnosis) | 4 |
| Behavior change for healthy lifestyle GDmHealth Plus app (UK) | - Weekly self-weighing  
- Carbohydrate counting  
- PA monitoring  
- Real-time feedback via HCP | Pilot study (mixed methods) | Hospital setting (at diagnosis) | 3 |
| Habits-GDM app (Singapore) | - Tracks diet and PA  
- Interactive educational content | Evaluation (RCT) | Hospital setting (at diagnosis) | 4 |
<table>
<thead>
<tr>
<th>Application</th>
<th>Features</th>
<th>Study Design</th>
<th>Setting</th>
<th>Theory</th>
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<tbody>
<tr>
<td>mGDM app (Nepal)</td>
<td>- Lifestyle coaching via in-app messaging</td>
<td>Trial registration (RCT)</td>
<td>Hospital setting</td>
<td>Social Cognitive</td>
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<tr>
<td></td>
<td>- Health education</td>
<td>(at diagnosis)</td>
<td></td>
<td>Theory</td>
</tr>
<tr>
<td></td>
<td>- Identification and setting of health goals</td>
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<td>3</td>
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<td></td>
<td>- Facilitates support from family members</td>
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<td>Stay Active App + (Mackillop)</td>
<td>- Two way interaction with HCP</td>
<td>Trial registration</td>
<td>Hospital setting</td>
<td>4</td>
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<tr>
<td>(UK)</td>
<td>- Remote motivational interviewing</td>
<td>(feasibility)</td>
<td>(at diagnosis)</td>
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<td></td>
<td>- PA goals can be reviewed</td>
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<tr>
<td></td>
<td>- feedback via messaging</td>
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<td>Postpartum</td>
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<tr>
<td>Education</td>
<td>Tu Puedes app (USA)</td>
<td>Pilot study (quasi-</td>
<td>N/A</td>
<td>1</td>
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<tr>
<td></td>
<td>- 4 ‘lessons’ about T2DM prevention</td>
<td>experimental with control)</td>
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<td></td>
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<tr>
<td></td>
<td>- Culturally applicable information</td>
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<tr>
<td>Behavior change for T2DMf prevention</td>
<td>nBuddy App (Singapore)</td>
<td>Evaluation (RCT)</td>
<td>Hospital setting</td>
<td>5</td>
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<tr>
<td></td>
<td>- Tracks diet and exercise with visual feedback</td>
<td>(at delivery)</td>
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<td></td>
<td>- Personalized education</td>
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<td></td>
<td>- Two way communication with health and lifestyle coach</td>
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<td></td>
<td>Trial registration (RCT)</td>
<td>N/A (3-8 months postpartum)</td>
<td>N/A</td>
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<td>Triangle App (Germany)</td>
<td>N/A</td>
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<td></td>
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<td>Trial registration (RCT)</td>
<td>N/A</td>
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<td>Health-e mums app + social media (Australia)</td>
<td>- Tracks weight, exercise and dietary intake</td>
<td>Pilot Study (qualitative)</td>
<td>N/A</td>
<td>7</td>
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<td></td>
<td>- Feedback via push notifications</td>
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<td>- Virtual health coach guides through 7 educational modules</td>
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<td>VR³ program (South Korea)</td>
<td>- 123 exercise options</td>
<td>Evaluation (quasi-</td>
<td>Hospital setting</td>
<td>5</td>
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<td></td>
<td>- Nutrition program</td>
<td>experimental with control)</td>
<td>(at delivery)</td>
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</table>
| Hola Bebe, Adios Diabetes App (USA) | - Ability to track diet with visual feedback  
- Stress relief exercises  
- Neonatal first aid program  
- Educational videos on PA and diet  
- Personalized action plans  
- Educational and motivational messages  
- Weight tracking  
- Recipes  
- Badge based reward system | Pilot study  
Community Health Centre (up to 5 years postpartum) | Social Cognitive Theory  
7 |

Table 1. Characteristics of mHealth for use during and after pregnancy

*a BGC – blood glucose control  
*b BG – blood glucose  
*c PA – physical activity  
*d RCT – randomized control trial  
*e HCP – healthcare professional  
*f T2DM – type 2 diabetes mellitus  
*g VR – virtual reality