

Adolescents Perceptions and Behaviors Towards Periodic Health Examinations in Riyadh, Saudi Arabia

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Abstract

Objectives: To evaluate and assess the awareness, knowledge, and level of application of recommended Periodic Health Examinations (PHEs) for adolescents in Riyadh. **Methods:** Descriptive Cross-sectional study, conducted among adolescents between June 2022 and January 2023. The Sample size was 1199 adolescents of both genders, between the ages of 12-20 years, studying in intermediate and secondary schools in Riyadh. The sample of participants was collected through a stratified multistage random sampling technique. Ethical approval and Ministry of Education acceptance were considered. The data was collected using a structured, self-administered questionnaire containing closed-ended questions. The level of knowledge was assessed by using three knowledge items; PHE definition, PHEs performance time, and the list of recommended PHEs known. The level of performance was assessed based on the performance of recommended (Six recommended PHEs by Saudi CDC) and none-recommended (Nine non-recommended PHEs as distractors). **Results:** Among the (1199) adolescents, the vast majority (70.6%) were aware of the PHEs. There is a positive attitude of adolescents toward PHEs, with (75.8%) acknowledging their importance and (87.1%) willing to undergo PHEs if given the opportunity. Despite this positive attitude, the actual knowledge and performance of PHEs remains relatively low, with (56.1%) being illiterate about it and only (36.8%) having undergone PHEs at least once, and a smaller percentage (26.1%) doing so regularly. There was a clear association ($p < 0.05$) between the level of knowledge and application. Adolescents with adequate knowledge had a higher prevalence of application (56.8% VS 43.2%). There was an association between Adolescents' level of education and their levels of knowledge and performance ($p < 0.05$). The more educated adolescents the higher their knowledge level and performance level. There was also an association between the availability of health insurance and application. The presence of health insurance increases the probability of applying PHEs. The most used sources of information regarding PHEs were digital

sources (62.1%). **Conclusion:** The study concluded that there is a positive attitude of adolescents toward PHEs. The study highlights a disparity in knowledge and performance of PHEs among adolescents, influenced by socio-demographic factors such as gender, nationality, type of school, and parental education. Females and students from private or international schools, as well as those with higher levels of parental education, demonstrated better knowledge and higher performance rates of PHEs. The research underscores the role of digital sources in educating adolescents about PHEs. This study emphasizes the need for targeted educational interventions to improve adolescent knowledge and performance of PHEs, considering the identified barriers and socio-demographic influences.

Key words: Periodic Health Examinations; Knowledge; Performance; Adolescents; Saudi Arabia

1 **Introduction:** Periodic health examinations (PHEs) are defined as
2 a group of medical procedures conducted periodically.(1,2) It aims
3 to assess an individual's overall health and identify any potential
4 health problems by detecting health problems at the earlier stage.
5 It also aims to help in the prevention of health problems by
6 identifying risk factors and providing preventive care. PHEs
7 commonly include information gathering, physical examinations,
8 laboratory investigations, and sometimes interventional
9 procedures. As it is performed regularly, the frequency of PHEs
10 varies depending on the age, sex, and health history. (2)

11 The impact of PHEs on the community health and health system;
12 including economy, health status, mortality, and morbidity rates; is
13 still controversial. Sources are fluctuating regarding its ability to
14 reduce morbidity, mortality, and the burden of the disease. ((3-7)
15 Furthermore, a study done in Japan on intermediate-aged workers
16 concluded that PHEs can significantly lower medical expenditures
17 for those who perform it regularly.(8) Another study also from Japan
18 which was conducted on a sample of 48757 participants aged 40-79
19 concluded that mortality rates are lower among those who applied
20 PHEs than those who didn't.(9) On the other hand, a meta-analysis
21 published in 2023, where research gathered from over two million
22 participants, concluded that there is no evidence to confirm that
23 PHEs can extend population lifetime.(10)

24 National wise, the Public Health Authority 'Weqaya' (Saudi Center
25 for Disease Prevention and Control) commissioned the 'National
26 Guideline for Periodic Health Examination' in 2014 and updated the
27 second edition in 2019 (11), later updated in its third edition in 2023
28 with a new the title 'Saudi Clinical Preventive Guideline'.(12) This
29 program aimed to create an efficient, easy-to-use memory aid that
30 would remind physicians of evidence-based recommendations to use
31 during PHEs. Such a tool would allow physicians to rigorously apply
32 recommendations in a format that would be easy to use in everyday
33 practice. The Saudi CDC divided the population into four categories
34 (Under 6 years), (6 - 17 Years old), (18 - 59 Years old), and (60 years

35 and above). The recommended PHEs for (6-17 Years old) are
36 including six items, which are: Evaluation of sun exposure and
37 vitamin D levels, screening for depression, screening for oral
38 hygiene, Measurement of Weight, Length, and BMI, screening for
39 Sexually transmitted diseases, and evaluation of smoking status and
40 cessation.(11)

41 Different populations showed different perceptions and performance
42 of PHEs. Globally, the studies, in many countries, showed that the
43 population has generally an average of good awareness (63.9%,
44 ± 24.8), (13-25) and knowledge (66.9%, ± 19.3) regarding the
45 recommended PHEs.(14,16,18,19,22-24,26-34) When it comes to
46 the performance of PHEs, the majority of studies demonstrated a low
47 level of performance. Lower percentages were observed in
48 populations (44.4%, ± 18.2) who have performed PHEs
49 regularly.(13-28,30-43)

50 The focus of the healthcare system on the Adolescent age group in
51 Saudi Arabia is crucial, as they represent a large percentage of the
52 total population. (44) Adolescence is a critical period for physical,
53 mental, and social development. It faces unique health challenges,
54 including mental health issues, substance abuse, Sexual health, and
55 non-communicable diseases (Obesity, diabetes, and cardiovascular
56 diseases, etc.).(45) Investing in adolescent health yields long-term
57 benefits for individuals and society.

58 There are a limited number of studies that specifically measure
59 adolescents' awareness and performance of the recommended PHEs
60 for their age group nationally and internationally. Some of those
61 studies comprehend the adolescent age group within other age
62 groups.(34,37,38,40,46) In addition, even though adolescents
63 represent a large number of the Kingdom of Saudi Arabia's
64 population,(44) there are no effective structured PHEs screening
65 systems in the Kingdom. This study was conducted to evaluate and
66 assess the levels of awareness and knowledge of adolescents in
67 Riyadh, Saudi Arabia regarding the recommended and non-
68 recommended PHEs for their age group and the status of
69 performance

70 **Methodology:** This Descriptive Cross-sectional study was
71 conducted among adolescents of both genders studying at public,
72 private, and international schools in Riyadh city, Saudi Arabia.

73 The data was collected in the period between June 2022 and January
74 2023. The Sample size was calculated to be 505 students (provided
75 that the assumed Prevalence of the practice is 30%, the Margin of
76 error is 0.04, and the Confidence interval is 95%), however, the
77 number of participants has been increased to attain an inclusive
78 representation of the targeted population. The study included all
79 male and female adolescents between the ages of 12-20 years

80 studying in intermediate and secondary schools in Riyadh, while the
81 first-grade intermediate students were excluded due to their age.

82 The sample was collected through a stratified multistage random
83 sampling technique. Riyadh city was divided into five sectors, and 8
84 schools (4 Male and 4 Female schools) were selected randomly from
85 each sector, then 2 classes were selected randomly from each grade
86 and then 20 students were chosen randomly from each class.

87 After selecting the eligible participants, the objectives of the study
88 were explained to them, the consent was obtained from the
89 participants and they were ensured that their data would remain
90 confidential. Furthermore, the ethical approval from the
91 Institutional Review Board at King Saud University (KSU-IRB [E-22-
92 7054]), and Ministry of Education acceptance were considered.

93 The data was collected using a structured, self-administered
94 questionnaire containing close-ended questions both in Arabic and
95 English language. The questionnaire was created based on the study
96 objectives and by revising relevant previous studies (14,15,17-
97 19,22,24). In order to ensure its reliability and validity, the
98 questionnaire was piloted on 40 adolescents before its final use.
99 PHEs for adolescents' awareness and performance were assessed in
100 the questionnaire through four sections.

101 The **first section** was the Socio-demographic characteristics,
102 (which included nine items; Gender, age, nationality, type of school,

103 grade, father's education, mother's education, past medical history,
104 and health-seeking facility.) The **second section** aimed to measure
105 adolescents' basic knowledge of PHEs (through six items, which
106 included; Self-assessment of awareness level, PHEs definition,
107 eligible individuals for PHEs, list of recommended PHEs known,
108 PHEs application time, and the adolescents' sources of information
109 to PHEs). The **third section** was added to assess the attitude of
110 adolescents towards PHEs for their age group, (which included three
111 items; the importance of PHEs, the tendency to apply PHEs, and the
112 anticipated barriers to PHEs application). The **fourth section**
113 covered the performance of PHEs, (which included six items; the
114 status of PHEs application, frequency of application, list of PHEs
115 performed, place of application, motivating factors for self-
116 application, and the willingness to encourage other adolescents to
117 perform PHEs).

118 The 'PHEs definition' item considered the study literature as follows
119 "A group of medical procedures conducted periodically, and aim to
120 check the health and some risk factors". (1,2) The 'list of PHEs' items
121 in the second and fourth sections were based on the 'National
122 Guideline for Periodic Health Examination' 2nd edition (2019) by
123 'Weqayah', which recommended six PHEs for adolescents, which
124 included; evaluation of sun exposure and vitamin D consumption,
125 screening for depression, screening for oral hygiene, measurement
126 of length, weight and BMI, screening for sexually transmitted
127 infections, and counseling for smoking cessation. However, another

128 nine commonly performed non-recommended PHEs were added to
129 the lists as distractors. The 'application time' item was also based on
130 the National Guideline, which was to be applied "**Annually**". (11)

131 **The level of knowledge** was assessed by evaluation of adolescents'
132 knowledge of; PHEs definition, the list of PHEs known, and PHEs
133 application time, found in the second section. Based on literature,
134 these three items were given three different weights according to
135 their importance. To calculate the level of knowledge; $\frac{1}{5}$ was given
136 to the correct definition, $\frac{3}{5}$ - in total - were given to the number of
137 '**recommended**' PHEs known from the list ($\frac{1}{5} = 1-2$, $\frac{2}{5} = 2-4$, and
138 $\frac{3}{5} = 5-6$), and $\frac{1}{5}$ was given for the correct application time. Those
139 who scored $\frac{3}{5}$ and more were considered with **adequate knowledge**
140 and those who scored less than $\frac{3}{5}$ were considered with **inadequate**
141 **knowledge**.

142 From the 'list of PHEs performed' item in the fourth section, **the**
143 **level of recommended PHEs performance** was assessed by the
144 number of 'recommended' PHEs performed, and was divided into
145 two categories: high performance (3 or more), and low performance
146 (less than 3). On the other hand, the **level of non-recommended**
147 **PHEs performance** (malpractice) was assessed by the number of
148 'non-recommended' PHEs performed, and was divided into four
149 categories; None performance (0), low performance (1-3), moderate
150 performance (4-6), and high performance (7 and more).

151 Data was entered into Google Forms from Paper Questionnaire, then
152 exported to Excel sheet and then transferred to SPSS 24 software
153 where it was cleaned and managed according to the quality of the
154 questionnaire. Chi-square and p-values were used for data analysis
155 and studying the association between different variables. The
156 association is considered significant if the p-value is below 0.05.

157 **Results:** The total number of adolescents who participated in the
158 study was (1199) students living in the city of Riyadh, Saudi Arabia.

159 **Table (1)** demonstrates the socio-demographic characteristics of
160 the study population. Both genders, male and female, participated
161 in a relatively equal distribution with a slight dominance of male
162 participants (55.5%). The participants' age ranged between 12-20
163 years with the majority aged between 15-16 years. As per the
164 nationality, Saudi constituted the majority (75.3%) as opposed to
165 non-Saudis (24.7%). Both public (68.3%) and private (21.6%)
166 national schools, in addition to international schools (10.1%) were
167 represented. The parental level of education varied among the
168 students; however, the majority are shown to be within graduate
169 and post-graduate levels (69.1%) for fathers and (58.2%) for
170 mothers. Individuals not diagnosed with chronic diseases were
171 significantly larger in number (87.7%) compared to those
172 diagnosed with chronic illnesses (12.3%). In terms of accessibility
173 to medical care; the participants exhibit a wide range of variation
174 in healthcare providers including private, public, and governmental
175 sectors.

176 The level of knowledge and awareness of the participating
177 adolescents about the PHEs recommended for their age group is
178 illustrated in **Table (2)**. The vast majority (70.6%) considered
179 themselves to have a good level of awareness. Approximately half of
180 the participants (51%) could recognize the correct definition of
181 PHEs. Regarding the recommended PHEs suggested by the Saudi
182 CDC, Evaluation of Sun exposure and Vitamin D levels were thought,
183 by participants, to be the most recommended examination with a
184 remarkable significance (51.3%) while screening for Sexually
185 Transmitted Diseases was selected by a fewer number of
186 participants (17.4%). On the other hand, most of the non-
187 recommended PHEs were selected by many participants. For
188 example: Complete Blood Count was selected by (46.5%) and blood
189 pressure measurement was selected by (45.9%). In consideration of
190 the accurate time to apply for a PHEs, more than half of the
191 participants identified the correct choice (51.3%). The majority
192 (62.1%) of participants attained their knowledge about the PHEs
193 from digital sources such as the Internet and TV.

194 The **attitude** of adolescents towards recommended PHEs for their
195 age group was generally positive. A large number of participants
196 (75.8%) acknowledged the importance of PHEs compared to those
197 who were neutral (8.4%), not sure (13.8%) or contradicted its
198 importance (1.9%). In addition, the majority of adolescents (87.1%)
199 would apply for PHEs if the opportunity arises. The barriers to hinder
200 adolescents from applying for PHEs vary. Some of these were related

201 to knowledge and attitude issues such as; inadequate knowledge of
202 the importance of PHEs (44.3%), the fear of visiting medical facilities
203 (30.5%), contradicting its need due to good health (27.8%), and the
204 lack of desire and enthusiasm (24.7%). The other factors stopping
205 them to apply PHEs were due to support and logistic issues like;
206 financial status (33.7%), inadequate time (28.9%), unavailability of
207 health insurance (25.9%), lack of family support (22.9%), and the
208 lack of transportation (16.7%).

209 The level of adolescents' performance of medical checkups is
210 represented in **Table (3)**. The results showed (47.4%) have
211 performed some PHEs, (36.8%) of them performed it once in the
212 past. However, the percentage of those who went on a
213 regular/periodic basis was (26.1%). In regards to the recommended
214 PHE, the evaluation of Sun exposure and Vitamin D levels were
215 tested for a large number of participants (57.4%), while Sexually
216 transmitted diseases screening remained the least recommended
217 test done among participants (3.9%). The most common non-
218 recommended PHEs performed by participants were complete blood
219 count (CBC) (50.2%), measurement of blood pressure (48.1%), and
220 measurement of blood glucose levels (33.1%). An approximation of
221 half of the participants have performed PHEs in public facilities
222 (49.5%). General health evaluation was the leading cause of seeking
223 medical attention for health evaluation (50.7%). Except for a few
224 outliers, the vast majority of participants (97.9%) who applied for
225 PHEs recommend it to other adolescents.

226 The association between Socio-demographic variables and the
227 adolescents' level of knowledge is shown in **Table (4)**. It has been
228 observed that more than half of adolescents were lacking in
229 knowledge regarding PHEs (56.1%). There were associations
230 between the level of knowledge and different socio-demographic
231 items; gender, nationality, type of school, grade, parents' education,
232 and health insurance. There was also consistency in the association
233 between knowledge items (PHE definition, numeration of
234 recommended PHEs, application time) and the overall level of
235 knowledge with the socio-demographic variables. In that regard,
236 (54.6%) of the females had an adequate level of knowledge in
237 comparison to the males (35.3%), ($p=.001$). It also found that
238 (55.1%) of Non-Saudis were more knowledgeable than Saudis
239 (40.2%), ($p=.001$). In addition, adolescents in private schools have
240 better knowledge (54.8%) compared to international (39.7%) and
241 public schools (41%), ($p=.001$). It was also observed that the level of
242 education of participants and their parents were correlated to the
243 participants' knowledge; the level of knowledge increased
244 proportionally with the school grade ($p=.024$). Moreover,
245 adolescents' parents with university degrees and higher had a higher
246 level of knowledge than those with secondary school education and
247 lower with (48.9% vs 34%) ($p=.001$) for the father's education and
248 (47.3% vs 39.7%) ($p=.009$) for the mothers' education.

249 The association between sociodemographic characteristics and the
250 status of PHE performance is shown in **Table (5)**. Females have a

251 higher percentage of performance (52.5%) in comparison to males
252 (43.2%), ($p=.001$). The type of school correlated with the
253 performance of PHEs. Students of international schools had a higher
254 rate of PHEs performance (62.8%) compared to private (47.5%) and
255 public schools (45.1%), ($p=.001$). There were also significant
256 differences between school grades in the performance of PHEs
257 ($p<0.001$), where younger adolescents had a lower performance rate
258 than the older ones (38.2%). It also found that there is an association
259 between parents' level of education and PHEs performance.
260 Adolescents who are the offspring of a father with a university
261 degree and higher (51.5%) or a mother with a university degree and
262 higher (51.4%) have a higher performance of PHEs, ($p=<0.002$).
263 Furthermore, participants who had health insurance had a higher
264 performance of PHEs than those who did not (60.8% Vs. 43.5%),
265 ($p=0.001$).

266 The association between the level of knowledge and the level of
267 performance of PHEs is represented in **Table (6)**. It observed that
268 the participants with an adequate level of knowledge had a higher
269 level of PHEs performance in comparison to those with an
270 inadequate level of knowledge (56.8% Vs. 40%), ($p=0.001$). In
271 addition, participants with an adequate level of knowledge had a
272 higher level of recommended PHEs performance than those with an
273 inadequate level of knowledge (8.4% Vs. 3.3%), ($p=0.001$). On the
274 other hand, there is a significant consistent negative association
275 between the performance of non-recommended PHEs and the

276 adequacy of knowledge. Those who performed more non-
277 recommended PHEs had higher levels of knowledge than those who
278 performed less non-recommended PHEs and vice versa, (p=0.001).

279 **Discussion:** Saudi Arabia has made significant advancements in
280 providing accessible and quality healthcare. The Ministry of Health
281 (MOH), through the Saudi Center for Disease Control and Prevention
282 (CDC) 'Weqayah', has developed national guidelines (11) for PHEs
283 for multiple age groups, including adolescents, as PHEs play an
284 essential role in preventive measures. Although MOH and CDC
285 provide efforts to apply PHEs, local studies revealed that awareness
286 and utilization of PHEs vary across demographics and
287 regions.(16,22-24,28,29,36,37,40) This study aimed to assess the
288 awareness, knowledge, and performance of PHEs among
289 adolescents in Riyadh.

290 According to the findings of this study, the vast majority **(70.6%) of**
291 **adolescents were aware of the existence of PHEs** for their age
292 group. This high level of individual awareness was directly in
293 alignment with many previous studies (13-15,17-21,25) and could
294 be credited to the efforts of MOH, Saudi CDC, and private healthcare
295 providers through the implementation of multiple health education
296 campaigns and programs such as; "Know your numbers" campaign,
297 School-based obesity control (Rashaqa) campaign, the national
298 guideline for PHEs and others. (11,47) Digital sources, such as; the
299 internet and television, were the most common sources for the

300 adolescents' information, which was consistent with multiple
301 previous studies (16,19,22), compared to a study in China, where the
302 most useful resource along with digital media was Medical staff. (26)

303 Adolescents exhibited **lower levels of knowledge towards the**
304 **details of PHEs, (43.9%)**. A similar study in Jazan, Saudi Arabia,
305 revealed that only (40%) had an adequate level of knowledge about
306 PHEs.(24) Also, a study in Northwest Nigeria concluded that only
307 (43%) of the participants demonstrated sufficient knowledge of
308 PHEs.(19) On the other hand, most studies showed higher levels of
309 PHEs related knowledge (14,16,22,27-34) . For example, a local
310 study conducted in Makkah region concluded that (76.4%) of the
311 participants had an adequate level of knowledge.(23) Despite the
312 higher levels of awareness and multiple attempts to improve the
313 perceptions among the population, the levels of knowledge weren't
314 adequate. This could be attributed to the limitations in the adequacy
315 and comprehensibility of health information, as highlighted by
316 specific findings in the Health Literacy Assessments done by local
317 studies.(48) A well-structured health education program for
318 adolescents should be planned and considered age-appropriate
319 information for their age group..

320 **There were clear associations between socio-demographic**
321 **characteristics of adolescents, like gender, nationality, and**
322 **educational level with knowledge and performance of PHEs.**
323 **In terms of gender with knowledge, females had better**

324 knowledge than males. This finding was in alignment with a study in
325 Makkah region where females were significantly more
326 knowledgeable than males (23), and also in Pakistan, where two
327 studies showed that females had better results than males, (20,33)
328 and in some other studies.(29,31,36) While in Jazan, Riyadh, and Al
329 Jouf, males were more knowledgeable than females.(16,22,24)
330 However, some studies reported no association between gender and
331 the level of knowledge. In Uganda for example, gender had no
332 significance in determining the knowledge adequacy of participants.
333 (15) In addition, the association between gender and performance in
334 the literature fluctuates, where some studies confirmed the
335 association (21,22,28,31,32,36,40,42,49) and others didn't. (13-
336 15,18,20,24,26,27,33,39,43) Overall, most literature clearly
337 indicates female dominance in the sense of knowledge and
338 performance of PHEs. This observation could be attributed to the
339 fact that females are more invested in their health-seeking behavior
340 because they confront the implication of any symptom they
341 experience, while males, conversely, tend to ignore their health to
342 be seen as strong and masculine.(50,51)

343 Individuals with high education often exhibit better health-seeking
344 behavior. This may originate from the suggestion that the increased
345 health literacy, can enable them to have a better understanding of
346 symptoms, treatment options, and preventive measures, which can
347 protect them from misinformation, missed diagnoses, delayed care,
348 and potentially worsening health outcomes.(52) In that regard, this

349 study reported a direct association between the **educational level**
350 **of adolescents or their parents with both the levels of**
351 **knowledge and performance of PHEs**, which was consistent with
352 most of the study literature, (13-19,21-24,29,31,33,36,38,40) while
353 some wasn't. (20,26,27,39,43) This emphasizes the positive role of
354 literacy on individuals' knowledge of their well-being.

355 **As expected, there was a positive association between the**
356 **presence of health insurance and the level of knowledge. It**
357 **also found that its motivated adolescents towards the**
358 **performance** of PHEs. Which was in alignment with other previous
359 studies. (21,34,36,37,40,53) however, some studies observed no
360 significance. (17,26) The positive impact was attributed to the ease
361 of use, the time-saving, the access to a broader range of healthcare
362 services, and incentive plans such as; discounts on gym
363 memberships and healthy lifestyle products. However, those with no
364 health insurance were eligible to seek healthcare without any cost
365 as the Kingdom of Saudi Arabia provides healthcare for free in all
366 public facilities to all citizens. These high levels of opportunities did
367 not match the levels of health accessibility. Studies suggested that
368 direct factors such as; limited staffing, higher workload, crowded
369 healthcare centers, shortage of required infrastructure, and lower
370 expertise were obstructing public healthcare.(17,22,24,49)

371 The identification of the meaning of PHEs among adolescents in this
372 study stands in the middle of international figures, where a study

373 claims that adolescents have good insight about the definition of
374 PHEs (17) and another study shows the opposite (19). The STDs, as
375 one of the recommended PHEs for adolescents, were the least
376 identified assessment by our participants. This was inconsistent with
377 a study in Africa where adolescents and adults thought that STDs
378 should be part of PHEs for adolescents, (54) and this definitely
379 reflects cultural differences.

380 The overall attitude of adolescents towards the perception and
381 practicing of PHEs seemed to be positive, and that could be observed
382 from their willingness to perform PHEs and the tendency to
383 recommend them to others which also led them to perform both
384 recommended and non-recommended PHEs.

385 As anticipated, almost half of adolescents engaged in some sort of
386 PHEs, and (26%) of them did it regularly. The majority of the study
387 literature had come to the same conclusion, that populations have a
388 low level of practice of PHEs.(13,15-19,21-24,27,28,31,34,36-
389 38,40-43) On the other hand, some studies presented surprisingly
390 promising results. (14,20,25,26,30,32,33,35,39) The justification for
391 this phenomenon according to adolescents was; Inadequate
392 knowledge, their financial status and unavailability of health
393 insurance, fear and worrying, being healthy, lack of desire and
394 enthusiasm, lack of family support, and lack of transportation, which
395 were also observed in some other studies. (14-17,19-
396 22,26,27,29,30,32-34,36,38-41,49,54)

397 Despite the widespread awareness and knowledge about the PHEs,
398 studies revealed a notable disconnection between knowing and
399 doing. While many communities demonstrated high levels of PHE
400 awareness and knowledge, the actual participation often falls
401 short.(13-19,21,23,27,36) However, the opposite was reported in
402 this study and also in other studies (14,20,25,30,32,33) and was
403 justified by the assumption that societies with more knowledgeable
404 populations had better exposure and experience with PHEs. (27)
405 This contradiction emphasizes the complicated nature of the
406 relationship between knowledge and practice, which was influenced
407 by a range of factors beyond knowledge spreading. Studies exploring
408 this relationship demonstrated the influence of factors such as;
409 financial status, availability of resources, accessibility, psychological
410 issues, and others on the practice (14-17,19-22,26,27,32-34,36,38-
411 41,49,54) which were compatible with what was indicated by
412 adolescents as obstacles hindering them from performing PHEs in
413 this study.

414 **Conclusion:** The study reveals an insight of the adolescents'
415 awareness, attitudes, and practices regarding PHEs. A significant
416 positive attitude of adolescents was observed towards PHEs. Despite
417 this positive attitude, the actual knowledge and performance of
418 PHEs remain relatively low. The study highlights a disparity in
419 knowledge and performance of PHEs among adolescents, influenced
420 by socio-demographic factors such as gender, nationality, type of
421 school, and parental education. The research also underscores the

422 role of digital sources in educating adolescents about PHEs.
423 However, investing in adolescents' age group in the research
424 community would encourage healthcare systems to adopt programs
425 targeting them to enhance their level of awareness and practice,
426 which will improve the community's attitudes toward this type of
427 health intervention. The healthcare systems are advised to
428 implement programs in schools or in primary healthcare that
429 empower school subjects to signify the importance of PHEs and
430 check adolescents' health periodically.

431 **Limitations:** The limitations of our study lie in the difficulty of
432 generalizing findings across diverse populations, given the inherent
433 variability in characteristics. Additionally, our reliance on adolescent
434 perception rather than medical records may have resulted in less
435 accurate outcomes. Furthermore, the scarcity of research on
436 periodic health examinations, particularly concerning adolescents,
437 hindered our ability to delve deeper into specific adolescent traits.

438 **Declarations:**

439 - **Consent to Participate:** According to the Ethics of Scientific
440 Research rules of King Saud University (55), and the General
441 Education School Regulations of Ministry of Education (56) in
442 Saudi Arabia regarding individuals younger than 18-year-old. In
443 case of Institutional Review Board (IRB) and Ministry of
444 Education (MOE) - and its departments - approval of a research
445 survey, then the school has the authority - held by its supervisors

446 - to accept or reject such proposal without the necessitate to
447 acquire consent from the parents nor legal guardians, as long as
448 no interventions is taking a place nor personal data are being
449 collected. After selecting the eligible participants, they were all
450 informed of the objectives of the study and were ensured that
451 their data would remain confidential, and the consent was
452 obtained from the all of the participants, as well as the legal
453 consent represented by the school's supervisors of each school
454 after reviewing the survey content to ensure it aligns with school
455 values and avoids sensitive topics.

456 - **Consent for Publication:** Not applicable

457 - **Funding:** This study was funded by the College of Medicine
458 Research Center, Deanship of Scientific Research King Saud
459 University, Saudi Arabia.

460 - **Ethics Approval:** The study protocol was approved by the
461 Institutional Review Board at King Saud University (KSU-IRB [E-
462 22-7054]), Ministry of Education (MOE) - and its departments -,
463 in addition, the consent was taken from all participant and
464 Schools' supervisors. All procedures performed in studies
465 involving human participants were in accordance with the ethical
466 standards of the institutional and/or national research committee
467 and with the 1964 Helsinki declaration and its later amendments
468 or comparable ethical standards.

469 - **Conflicts of Interest:** The authors declare that they have no
470 conflict of interest.

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477 were invaluable to this research endeavor.

478 - **Availability of Data and Materials:** All materials described in
479 this manuscript, including all relevant raw data, will be freely
480 available to any scientist wishing to use them for non-commercial
481 purposes. The questionnaire used for data collection in this study
482 is available for download as a supplementary file. The
483 questionnaire was developed by the authors specifically for this
484 research project and includes a combination of original questions
485 and questions adapted from previous studies (14,15,17-
486 19,22,24). We acknowledge the original authors of the adapted
487 questions by citing their studies. A table detailing the assessment
488 criteria and methodology used in the assessment of the level of
489 knowledge and the table discussing the attitude of adolescents
490 towards PHEs are included in the supplementary materials
491 accompanying this manuscript. The 'National Guideline of
492 Periodic Health Examination 2nd Edition (2019)' supporting the
493 findings of this study is available within the supplementary files
494 of this article, as 'Weqaya' has updated it to the newer version
495 'Saudi Clinical Preventive Guideline 3rd Edition (2023)' and may

496 no longer be available in its original form. The previous version
 497 of the document, which was utilized in this study, is included in
 498 the supplementary files for reference and transparency.

Table 1. Socio-demographic characteristics of participating adolescents in Riyadh

Items	No.	%	
Gender	Male	666	55.5
	Female	533	44.5
Age	12	24	2.0
	13	158	13.2
	14	238	19.8
	15	248	20.7
	16	250	20.9
	17	208	17.3
	18-20	73	6.1
Nationality	Saudi	903	75.3
	Non-Saudi	296	24.7
Type of school	Public	819	68.3
	Private	259	21.6
	International	121	10.1
Grade	2nd intermediate schools	283	23.6
	3rd intermediate schools	165	13.8
	1st secondary schools	270	22.5
	2nd secondary schools	244	20.4
	3rd secondary schools	237	19.8
Father Educational	University Degree and above	793	66.1
	Secondary school and below	406	33.9
Mother Educational	University Degree and above	660	55
	Secondary school and below	539	45
Health status	Healthy	1052	87.7
	Chronically-ill	147	12.3
Accessibility to Healthcare	I don't know	325	27.1
	Government sector	242	20.2
	Public hospitals	240	20
	Standard insurance	172	14.3
	Private hospitals	124	10.3
	VIP Insurance	96	8

Table 2. The level of knowledge and awareness of adolescents about the PHEs recommended in Riyadh

Items	No.	%	
Self-assessment of	Aware	846	70.6

awareness	Not aware	353	29.4
	Correct	611	51.0
	Incorrect	286	23.8
PHE definition	I don't know	302	25.2
	Healthy individuals	97	8.1
	Sick individuals	140	11.7
Eligible individuals to perform PHEs	Both of them	734	61.2
	I don't know	228	19.0
	Evaluation of Sun exposure and Vitamin D levels*	615	51.3
Recommended PHEs known	Complete Blood Count (CBC)	557	46.5
	Blood pressure	550	45.9
	Weight, length, and BMI*	536	44.7
	Blood Glucose levels	505	42.1
	Screening for Depression*	383	31.9
	Cholesterol and TAGs levels	367	30.6
	Evaluation of Smoking status and cessation*	340	28.4
	Thyroid gland	338	28.2
	Kidney Functions test	337	28.1
	Liver functions test	298	24.9
	Evaluation of Oral Hygiene*	278	23.2
	Stool and urine analysis	262	21.9
	Hepatitis screening	228	19.0
	Sexually transmitted diseases*	209	17.4
	I don't know	293	24.4
Application time	Others	38	3.2
	Correct	615	51.3
	Incorrect	356	29.7
Sources of information	I don't know	228	19.0
	Internet and social media	605	50.5
	Family	411	34.3
	I don't have enough knowledge	330	27.5
	School's subjects	212	17.7
	Medical team	212	17.7
	Friends	206	17.2
	TV programs	139	11.6
Other	38	3.2	
*: Recommended by Saudi Center for Disease Prevention and Control (Weqaya) 'National Guideline of Periodic Health Examination' 2 nd Edition (2019)			

Table 3. The level of adolescents' performance of medical checkups in Riyadh

Items	No.	%	
Status of performance	Didn't Performed	631	52.6
	Performed	568	47.4
<i>Total =</i>		1199	100
Frequency of Performance	Irregularly	211	37.1
	Once	209	36.8
	Regularly (Yearly, every 6 months)	148	26.1
<i>Total =</i>		568	100
Checkups done	Evaluation of sun exposure and Vitamin D levels*	326	57.40
	Weight, length, and BMI*	294	51.80

	Complete Blood Count (CBC)	285	50.20
	Blood pressure	273	48.10
	Blood Glucose levels	188	33.10
	Evaluation of Oral hygiene*	162	28.50
	Cholesterol and TAGs levels	152	26.80
	Thyroid gland	148	26.10
	Stool and urine analysis	133	23.40
	Kidney functions tests	97	17.10
	Liver functions tests	80	14.10
	Screening for Depression*	61	10.70
	Evaluation of smoking status and cessation *	57	10.00
	Hepatitis screening	36	6.30
	Sexually transmitted diseases*	22	3.90
	Others	49	8.60
Location of performance	Public hospital	238	41.9
	Private hospital	201	35.4
	Public clinic	43	7.6
	Private clinic	35	6.2
	Private lab	29	5.1
	Others	22	3.9
Motivators to perform Checkups	General health evaluation	288	50.70
	Worrying	164	28.90
	Early detection of diseases	159	28.0
	Family history	84	14.80
	Quit harmful habits	33	5.80
	Others	65	11.40
Recommendation	Yes	556	97.9
	No	12	2.1
*: Recommended by Saudi Center for Disease Prevention and Control (Weqaya) 'National Guideline of Periodic Health Examination' 2 nd Edition (2019)			

Table 4: The association between Socio-demographic variables and the adolescents' level of knowledge

Items	Level of knowledge		P-value (chi-square)
	Inadequate (< 3)	Adequate (≥ 3)	
Overall = 1199 (100%)	673 (56.1)	526 (43.9)	
Gender			
Male	431 (64.7)	235 (35.3)	.001 (44.838)
Female	242 (45.4)	291 (54.6)	
Nationality			
Saudi	540 (59.8)	363 (40.2)	.001 (20.013)
Non-Saudi	133 (44.9)	163 (55.1)	
Type of school			
International	73 (60.3)	48 (39.7)	.001 (16.184)
Private	117 (45.2)	142 (54.8)	
Public	483 (59.0)	336 (41.0)	
Grade			
2nd-grade intermediate	163 (57.6)	120 (42.4)	.024

school			(11.261)
3rd-grade intermediate school	101 (61.2)	64 (38.8)	
1st-grade secondary school	162 (60.0)	108 (40.0)	
2nd-grade secondary school	135 (55.3)	109 (44.7)	
3rd-grade secondary school	112 (47.3)	125 (52.7)	
Father education			
Secondary school/below	268 (66.0)	138 (34.0)	.001
University/above	405 (51.1)	388 (48.9)	(24.333)
Mother education			
Secondary school/below	325 (60.3)	214 (39.7)	.009
University/above	348 (52.7)	312 (47.3)	(6.904)
Health status			
Chronic ill	80 (54.4)	67 (45.6)	.656
Healthy	593 (56.4)	459 (43.6)	(0.199)
Health insurance			
Have health insurance	119 (44.4)	149 (55.6)	.001
No health insurance/Don't Know	554 (59.5)	377 (40.5)	(19.276)

Table 5: The association between sociodemographic characteristics and the status of PHE performance.

Items	Status of PHE performance		
	Performed	Didn't perform	p-value (chi-square)
Overall = 1199 (100)	568 (47.4)	631 (52.6)	
Gender			
Male	288 (43.2)	378 (56.8)	.001
Female	280 (52.5)	253 (47.5)	(10.248)
Nationality			
Saudi	414 (45.8)	489 (54.2)	.065
Non-Saudi	154 (52.0)	142 (48.0)	(3.415)
Type of School			
International	76 (62.8)	45 (37.2)	
Private	123 (47.5)	136 (52.5)	.001
Public	369 (45.1)	450 (54.9)	(13.332)
Grade			
2nd intermediate	108 (38.2)	175 (61.8)	.001

3rd intermediate	87 (52.7)	78 (47.3)	(19.939)
1st secondary	117 (43.3)	153 (56.7)	
2nd secondary	131 (53.7)	113 (46.3)	
3rd secondary	125 (52.7)	112 (47.3)	
Father education			
Secondary/below	160 (39.4)	246 (60.6)	.001
University/above	408 (51.5)	385 (48.5)	(15.617)
Mother education			
Secondary/below	229 (42.5)	310 (57.5)	.002
University/above	339 (51.4)	321 (48.6)	(9.379)
Health status			
Chronically ill	93 (63.3)	54 (36.7)	.001
Healthy	475 (45.2)	577 (54.8)	(16.973)
Health insurance			
Have	163 (60.8)	105 (39.2)	.001
Don't have	405 (43.5)	526 (56.5)	(25.037)

Table 6: The association between the level of knowledge and the level of PHE performance

Items	Level of Knowledge		P-value (chi-square)
	Adequate	Inadequate	
Status of PHE performance			
Performed PHEs	299 (56.8)	269 (40)	.001
Didn't perform PHEs	227 (43.2)	404 (60)	(33.719)
<i>Total (1199)</i>	526	673	
The levels of Recommended PHEs performance*			
Low (0-3)	274 (91.6)	260 (96.7)	.012
High (4-6)	25 (8.4)	9 (3.3)	(6.330)
<i>Total (568)</i>	299	269	
The levels of Non-Recommended PHEs performance**			
None (0)	17 (5.7)	45 (16.7)	.001 (35.177)
Low (1-3)	180 (60.2)	177 (65.8)	
Moderate (4-6)	79 (26.4)	43 (16.0)	
High (7-9)	23 (7.7)	4 (1.5)	
<i>Total (568)</i>	299	269	

Notes:

*: **Six Recommended PHEs for adolescents:**

1/Low: performed (0-3) of the recommended PHEs,

2/High: performed (4-6) of the recommended PHEs.

**** Nine Non-Recommended PHEs for adolescents:**

- 1/ None: performed (0) of the non-recommended PHEs,
2/ Low: performed (1-3) of the non-recommended PHEs,
3/ Moderate: performed (4-6) of the non-recommended PHEs,
4/ High: performed (7-9) of the non-recommended PHEs.
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Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PerceptionTable.pdf](#)
- [EvaluationTable.pdf](#)
- [Questionnaire.pdf](#)
- [NationalGuidelineforPeriodicHealthExamination2ndEdition2019.pdf](#)