According to one study, 85% of teenagers are likely to suffer from acne outbreaks between the ages 12 to 25 years among whom 25% could progress to permanent scarring [2]. The relationship between acne and dairy products has been documented in the medical literature. However, controversial results are shown. The most recent study was a cross-sectional study of 182 participants in Kazakhstan with acne vulgaris [3]. It was found that the risk of acne occurrence is significantly higher (p<0.001) in people with the highest milk and dairy product consumption level [3]. There is substantial epidemiological and biochemical evidence supporting the role of milk and dairy products as enhancers of insulin-like growth factor 1 (IGF-1) signaling which is a one of several factors that cause inflammation in humans and eventually lead to acne presentation and aggravation [4].

1. Introduction
Acne vulgaris is a common cutaneous disorder. Its prevalence is up to 80% in the majority of countries worldwide [1]. There are multiple factors that play a role in acne which include genetic, hormonal and stress. According to one study 85% of the teenagers are likely to suffer from acne outbreaks between the ages 12 to 25 years among whom 25% could progress to permanent scarring [2]. The relationship between acne and dairy products has been documented in the medical literature. We will assess this relationship in our study.

2. Statement of research
Many studies were done questioning the relationship between acne and diet, especially dairy products. Some have shown controversial results. The most recent study was a cross-sectional study of 182 participants in Kazakhstan in which the daily consumption of milk and dairy products was assessed. It was found that the risk of acne occurrence is significantly higher (p<0.001) in people with the highest milk and dairy product consumption level [3]. There is substantial epidemiological and biochemical evidence supporting the effects of milk and dairy products as enhancers of insulin-like growth factor 1 (IGF-1) signaling which is one of several factors that cause inflammation in humans and eventually lead to acne presentation and aggravation [4]. In Saudi Arabia, a study on the influence of milk and milk products on the risk and severity of acne in young people was never done. So the aim of this study was to assess the relation between dairy products and acne risk and severity among young adult patients attending the dermatology clinics at King Fahd Hospital of the University (KFHU) in Alkhobar, Saudi Arabia.

3. Aim of research
Assess the relation between dairy products and acne risk and severity among young adult patients attending the dermatology clinics at King Fahd Hospital of the University (KFHU) in Alkhobar, Saudi Arabia.
tinuous data and Mann-Whitney U Test for skewed data were used to compare the difference in the explanatory variables between cases and control. Univariate logistic regression of all significant factors from the associations test were performed, followed by a multivariate logistic regression analysis on the all significant risk factors.

### Table 1

| Variable* | Definition | Scale |
|-----------|------------|-------|
| Age       | Participant age calculated from date of birth till the day of questionnaire collection | Years |
| Sex       | Answers provided to specific question in questionnaire. | Questionnaire – Male – Female |
| Wt.       | Participant wt measured by the researcher using a scale in the hospital at the day of questionnaire collection | Kg |
| Ht        | Participant ht measured by the researcher using a body meter in the hospital at the day of questionnaire collection | Cm |
| Dairy Consumption | The Type & frequency of dairy product Consumption | Food frequency questionnaire |
| Milk Consumption | The Type of Milk Consumption | Food frequency questionnaire |
| Food with high glyceomic index | Participant intake of white bread, rice, chocolate, French fries & Pizza. | Questionnaire – Yes – No |
| Acne severity | The severity of acne calculated by the treating physician after a clinical examination using the Global acne grading system. | Questionnaire – Mild – Moderate – Sever – Very sever |

Note: * Variables adapted from reference 10

### Table 2

| Location | Factor |
|----------|--------|
| Forehead | 2      |
| Right cheek | 2 |
| Left cheek | 2 |
| Nose      | 1      |
| Chin      | 1      |
| Chest and upper back | 3 |

Global acne grading system

Note: each type of a lesion is given a value depending on severity, no lesion=0, comedones=1, papules=2, and nodules=4. The score for each area is calculated using the formula: local score=factor*grading (0–4). The global score is the sum of local scores, and acne severity was graded using the global score. A score of 1–18 is considered mild; 19–30 moderate, severe and >39, very severe

### 5. Results

There was similar gender distribution between the cases and controls. Their ages varied between 13 to 25 years. However, there was a statistically significant difference in the age, between the cases and the controls (p=0.005) showing that cases group had younger ages than the controls. In other words, the mean age of females in the case group was (20.5±3.2) which is significantly lower as compared to females in the control group (22.4±2.2) (p=0.004). No statistically significant difference (p<0.05) between the cases and control groups in weight body mass index and height for both sexes.

After adjusting for other predictors, the risk of acne increased with increasing age; OR (odds ratio) =1.39; 95 % CI (confidence interval: 1.14–1.68) (p=0.001). In case the subject consumes French fries, there is a five-fold greater risk for acne (OR=4.60; 95 % CI: 1.21–17.51) (p=0.025). If butter is consumed more than once a week the risk for acne increased (OR=3.76; 95 % CI: 1.21–11.62) (p=0.022). No statistically significant difference (P<0.05) was found between the severity of acne with all the dietary factors for the cases except for consumption of milk (p=0.033) (Table 3).

### Table 3

| Characteristic n (%) | Acne severity | Chisquare | P value |
|----------------------|---------------|-----------|---------|
|                      | Mild | Moderate/severe | Overall |
| 1                    | 2    | 3       | 4      | 5    | 6 |
| Sex                  |      |         |        |      |    |
| Male                 | 2 (10.0) | 8 (26.7) | 10 (20.0) | 2.083* | 0.279 |
| Female               | 18 (90.0) | 22 (73.3) | 40 (80.0) |       |     |
| Milk                 |      |         |        |      |    |
| >=2 day              | 4 (20.0) | 3 (10.0) | 7 (14.0) |       |     |
| 1 day                | 1 (5.0) | 9 (30.0) | 10 (20.0) | 8.479* | 0.033 |
| 2–6 week             | 9 (45.0) | 5 (16.7) | 14 (28.0) |       |     |
| <=1 week             | 6 (30.0) | 13 (43.3) | 19 (38.0) |       |     |
### Table 3: Consumption of Different Dairy Products

| Type of Dairy | >=2 day | 1 day | 2–6 week | <=1 week | P-value |
|--------------|---------|-------|----------|----------|---------|
| Chocolate milk | -       | 0 (0.0) | 4 (20.0) | 16 (80.0) | 2.486* |
| Ice cream     | -       | 0 (0.0) | 5 (25.0) | 13 (65.0) | 1.039* |
| Yogurt        | -       | 0 (0.0) | 8 (40.0) | 10 (50.0) | 2.431* |
| Halloumi cheese | -     | 0 (0.0) | 2 (10.0) | 18 (90.0) | 2.328* |
| Cream cheese  | -       | 3 (15.0) | 9 (45.0) | 14 (70.0) | 1.665* |
| Hard cheese   | -       | 3 (15.0) | 3 (15.0) | 14 (70.0) | 1.254* |
| Milk shake    | -       | 1 (5.0)  | 3 (15.0) | 16 (80.0) | 4.380* |
| Butter        | -       | 1 (5.0)  | 3 (15.0) | 16 (80.0) | 3.380* |
| Type of milk  | Whole   | 9 (45.0) | 9 (45.0) | 2 (10.0) | 4.380* |
|              | Low fat | 9 (45.0) | 10 (33.3) | 0 (0.0) | 0.341 |
|              | Skimmed| -       | 1 (3.3)  | 4 (13.3) | 0.644 |
|              | Don’t know | 2 (10.0) | 1 (3.3)  | 4 (13.3) | 0.341 |
|              | Don’t drink | -       | 3 (6.0)  | 4 (8.0) | 0.341 |
6. Discussion

This case control study was conducted at the dermatology clinics at King Fahd Hospital of the University in Alkhobar, Saudi Arabia for a period of one year starting March 2015 to April 2016 to assess the relation between dairy products consumption and acne risk and severity in young adult patients with acne using interview questionnaires. After adjusting for other predictors, the risk of acne increased with increasing age (OR=1.39; 95% CI: 1.14–1.68) (p=0.001). There was no statistically significant difference (P<0.05) found between the severity of acne with all the dietary factors including chocolate milk, ice cream, yogurt, halloumi cheese, cream cheese, hard cheese, milk shake, butter, type of milk, french fries, pizza, chocolate, rice, white bread except for consumption of milk which was χ²(3, 50)=8.479 (p=0.033). This contradicts the findings in other similar studies done in the world who found a strong correlation between milk and dairy product consumption and the risk of acne development [3, 5–10]. However, butter, rice and french fries were positively associated with increased risk for acne. Specifically patients consuming french fries had a five-fold greater risk (OR=4.60; 95% CI: 1.21–17.51) (p=0.025) for acne compared to the controls. Pathophysiologically, milk consumption significantly elevates insulin and IGF-1 (Insulin growth factor 1) levels and decreases IGBP-3 levels [11]. It also contains bovine IGF-1, which is identical to human IGF-1 and binds with the same affinity to its receptor [12]. Increased insulin and IGF-1 signaling promote comedogenesis, sebaceous lipogenesis, follicular inflammation, and androgenic stimulation [13]. Milk also contains dihydrotestosterone precursors, including placenta-derived progesterone, 5α-pregnanedione, 5α-androstenedione, and numerous growth-related factors which in turn aggravate acne [14]. Only the frequency of milk consumption was positively associated with acne severity while the type of milk made no statistically significant difference. This is partially similar to the findings in the Egyptian study done by saleh et al on a 100 acne patients assessing the relationship between the dietary intake of acne patients and acne severity [15]. The most notable limitations of this study were the retrospective self-reported dairy product consumption and data was not adjusted for some important confounding variables (such as stress, inadequate sleep, smoking, family history of acne). There are multiple randomized controlled trials that have shown the benefit of a low glycemic index/glycemic load diet in treating acne so this diet may be recommended to patients [16–19]. While observational studies support the link between milk and acne, multiple randomized controlled trial are required before milk restriction diets can be recommended to acne patients.

7. Conclusion

1. Dairy products consumption does not seem to influence or aggravate acne development in our young adults who were Saudis except for milk.

2. Randomized controlled trials are highly recommended to establish a causal relationship between frequent milk consumption and acne severity and to assess the role of medical nutrition therapy (MNT) in acne management.

3. A practical approach is to address each acne patient individually and consider the possibility of dietary counseling.

Acknowledgements

We would like to give our thanks to Dr. Abdullah Aljoudi in the Community Medicine Department at King Fahd Hospital of the University and all the participants involved in this study and to the staff members of Department of Dermatology at King Fahd Hospital of the University. We also would like to acknowledge Dr. Abeer Alghwairi effort in data collection.
