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# Run distribution and catch-out dynamics in male T20 cricket: performance analysis of Bangladesh against elite global performers

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**Abstract**

*Background and Study Aim* T20 cricket is characterized by rapid scoring, high-risk shot selection, and demanding fielding requirements. In this format, team performance depends on how effectively runs are distributed across fielding zones and how batting risks translate into dismissals. Despite the application of diverse batting strategies in T20 cricket, their relative effectiveness in balancing scoring opportunities and catch-out risk remains a matter of practical interest. The aim of this study is to compare run distribution patterns and catch-out dynamics of the Bangladesh national T20 cricket team with those of elite global performers.

*Material and Methods* A retrospective study analyzed 1,407 runs and 30 catch-outs from 10 Bangladeshi men's T20 matches in 2024. Run distribution and catches were mapped using wagon-wheel analysis with data from Cricbuzz, ESPN Cricinfo, and NDTV Sports, cross-verified with match footage. Data were analyzed in SPSS 22 using descriptive statistics, chi-square, Linear-by-Linear Association, and Kruskal–Wallis tests ($p < 0.05$).

*Results* Runs were evenly distributed, with Mid-Off contributing most (12%). Long-On, Mid-Wicket, and Square Leg had moderate runs but very low catch risk (0–3%). Catches were concentrated at Mid-Off, Extra Cover (6 vs. 3.1), and Third Man (5 vs. 3.1). Fewer catches at Long-On (0) and Square Leg (1) indicate safer areas. Statistical tests showed no strong overall association. Some trends highlighted T20 risk–reward patterns. Zone 3 was high-risk, high-reward (12% runs, 19% catches, SER 6.3, ZRI 1.58). Zones 6, 7, and 9 were safe (8–9% runs, 0–3% catches, SER 3–8, ZRI <0.33). Other zones showed moderate risk–reward (SER 1.43–3.67, ZRI 0.27–0.7).

*Conclusions* The analysis of the Bangladeshi men's T20 performance reveals important fielding and scoring patterns. In T20 cricket, the Bangladeshi men's team scored runs fairly evenly across the field. However, some areas were riskier for their batsmen. Shots toward Third Man and Extra Cover resulted in more catches, increasing the chance of getting out. In contrast, Long-On, Mid-Wicket, and Square Leg were safer, offering better opportunities to score runs with less risk. Recognizing these patterns can help batsmen aim for safer areas, while fielders focus on high-risk regions.

**Keywords:** wagon-wheel zoning, scoring patterns, fielding risk profiles, aerial dismissal hotspots, run-frequency variation.

## Introduction

Twenty20 (T20) cricket represents a high-intensity format in which match outcomes are strongly influenced by rapid scoring demands and dynamic fielding conditions. In this context, batting performance is shaped by the spatial distribution of shots across the field and the associated risk of dismissals, particularly through catches. The interaction between run-scoring opportunities and fielding pressure makes shot selection a complex and situational process. Analysis of run distribution and catch-out patterns across fielding zones allows performance characteristics in elite-level T20 competition to be examined in a structured manner.

In context, Twenty20 cricket has transformed the global cricketing landscape by introducing a fast-paced, high-intensity format in which scoring efficiency, risk-reward decision-making, and fielding precision are central determinants of success [1, 2]. Unlike longer formats, T20 cricket compresses player actions into a short time frame. This compression makes micro-performance indicators, such as run distribution patterns and modes of dismissal, critical for team outcomes [3, 4]. The evolution of T20 leagues worldwide, including the Indian Premier League (IPL), Big Bash League (BBL), and the Caribbean Premier League (CPL), has contributed to the development of advanced performance


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analytics. These analytics allow teams to optimize batting orders, boundary-hitting frequencies, strike-rotation strategies, and catching efficiencies [5, 6]. In contemporary cricket analytics, two metrics, how runs are accumulated and how batters are dismissed, serve as benchmarks for differentiating elite teams from developing cricket nations [7].

Bangladesh's progression in international cricket began with gaining Test status in 2000 and continued with the establishment of the Bangladesh Premier League (BPL) in 2012. These developments significantly expanded the national talent pool and competitive exposure [8]. Despite notable achievements, Bangladesh's T20 performance remains inconsistent when compared with elite teams such as India, Australia, England, and New Zealand [9, 10]. Existing analyses indicate that Bangladesh often exhibits lower boundary percentages, less aggressive power-play scoring, and a higher proportion of dismissals resulting from catch-out events, particularly in the outfield and deep boundary regions [11, 12]. Catch-out dismissals are especially decisive in T20 cricket, where high aerial risk accompanies boundary-oriented play, making fielding quality a vital differentiator among top-performing sides [6, 13].

Analysis of research findings has shown that performance in T20 cricket is closely linked to how teams manage scoring opportunities and dismissal risks under time-constrained conditions. Researchers emphasize that run distribution patterns and catch-out dynamics reflect the interaction between batting strategies and fielding structures, particularly in high-pressure match situations. Authors also note that these performance characteristics vary across teams and competitive levels, indicating the multifactorial nature of success in T20 cricket. At the same time, unresolved aspects related to the balance between scoring efficiency and catch-out risk across fielding zones continue to limit a comprehensive interpretation of team performance in this format.

In addition, it should be noted that despite growing interest in T20 analytics, comparative examination of how Bangladesh's run distribution patterns and catch-out dynamics differ from those of elite global teams remains limited. This situation restricts a detailed understanding of the specific performance characteristics that influence Bangladesh's competitiveness in the T20 format. The aim of this study is to compare run distribution patterns and catch-out dynamics of the Bangladesh national T20 cricket team with those of elite global performers.

## Materials and Methods

*Subjects*

Data were collected from three T20 series played by Bangladesh against India, the USA, and Zimbabwe in 2024. The dataset comprised a total of 10 matches. Across these matches, 1,407 runs and 30 catch-outs were recorded and included in the analysis.

*Research Design*

This study employed a retrospective observational design to examine run distribution patterns and catch-out dynamics of the Bangladesh national T20 cricket team during the 2024 season. Performance indicators were benchmarked against elite global standards. The analysis focused on the role of catch-outs in T20 cricket and the relationship between scoring patterns and match outcomes.

*Criterion Measurement*

Run distribution and catch-out dynamics were assessed using established cricket analytics criteria. Run distribution was mapped using scoring areas and wagon-wheel analysis to quantify scoring patterns across fielding zones. Catch-out events were recorded according to fielding zone to evaluate defensive effectiveness. Wagon-wheel zones were numerically coded as follows: 1 = Third Man, 2 = Point, 3 = Extra Cover, 4 = Cover, 5 = Long-Off, 6 = Long-On, 7 = Wide Mid-Wicket, 8 = Mid-Wicket, 9 = Square Leg, and 10 = Fine Leg.

Figure 1 illustrates the wagon-wheel zone classification.

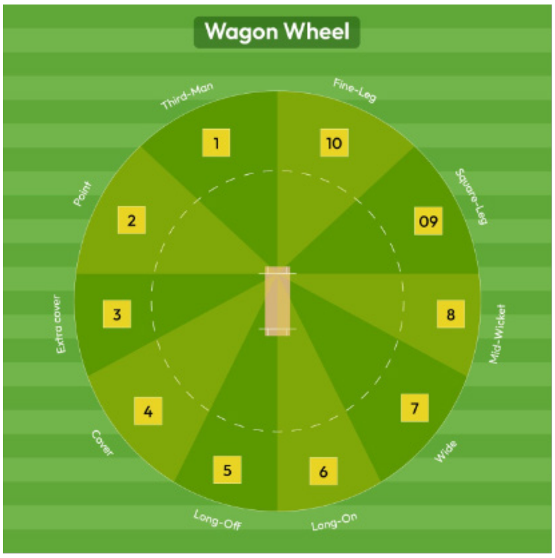


**Figure 1.** Wagon wheel

*Zone-Based Metrics*

In addition to run and catch percentages, two zone-based metrics were calculated to provide further insight into batting efficiency and dismissal risk.

Shot Efficiency Ratio (SER) was calculated as runs scored in a zone divided by the number of catch-outs in that zone plus one. The addition of one was used to avoid division by zero. Higher SER values indicate greater run yield relative to dismissal risk.

Zone Risk Index (ZRI) was calculated as catch percentage in a zone divided by run percentage in that zone. ZRI values greater than one indicates higher-risk zones, whereas values below one indicates safer scoring zones.

*Instruments and Tools*

Secondary data were obtained from NDTV Sports, Cricbuzz, and ESPN Cricinfo. These platforms provided ball-by-ball commentary, live scores, match summaries, statistical visualizations, and wagon-wheel charts required for detailed analysis of run scoring and catch-out events.

*Data Collection Procedure*

Data collection followed a structured procedure. First, the required variables were defined, focusing on ball-by-ball run outcomes and catch events. Data were extracted from Cricbuzz for detailed scoreboards and commentary, ESPN Cricinfo for match statistics and analytical information, and NDTV Sports for visualizations, including pie charts and wagon-wheel distributions. All extracted data were cross-verified using match footage to ensure accuracy.

*Data Workflow, Cleaning, and Verification*

Ball-by-ball data and catch events were collected from Cricbuzz, ESPN Cricinfo, and NDTV Sports and cross-verified with match footage. The data were cleaned, coded, and organized by match, over, and wagon-wheel zone according to standard fielding positions, as shown in Fig. 1. Runs and catch-outs were consistently assigned to zones using this classification. During video verification, two independent observers reviewed all events. Any discrepancies were resolved through discussion to reach consensus, ensuring inter-rater reliability. The finalized dataset was used for the calculation of SER and ZRI and for subsequent statistical analyses.

High-risk zones were defined as areas with catch percentages of 10% or higher, while safe scoring zones were defined as areas with catch percentages of 3% or lower. Run-scoring efficiency in each zone was quantified using SER, calculated as run percentage divided by catch percentage. Risk-adjusted scoring potential was assessed using ZRI, calculated as catch percentage divided by run percentage.

*Data Workflow*

Video footage from 10 T20 matches was reviewed for shot identification. Each shot was classified into one of 10 wagon-wheel zones, followed by outcome coding as runs or catch-outs. The data were then entered, cleaned, and coded before statistical analysis in SPSS, including descriptive statistics, chi-square tests, trend analyses, and Kruskal–Wallis tests. SER and ZRI values were subsequently calculated, followed by visualization and interpretation of results.

*Statistical Analysis*

All data were analyzed using SPSS 22. Statistical significance was set at $p < 0.05$. Descriptive statistics, expressed as percentages, were used to summarize run distribution patterns and catch-out frequencies across the ten wagon-wheel zones. Wagon-wheel diagrams were generated to visualize the spatial distribution of runs and catches. In addition, the Shot Efficiency Ratio (SER) was calculated for each zone as runs (%) divided by catch (%) to quantify scoring efficiency relative to dismissal risk. Risk-adjusted scoring potential was assessed using the Zone Risk Index (ZRI), calculated as catch (%) divided by runs (%). Pearson's chi-square test was used to examine the association between catch occurrences and wagon-wheel zones, and assumptions related to expected cell counts were evaluated. When expected frequencies were insufficient, interpretations were made cautiously and were supplemented with the Linear-by-Linear Association test to explore directional trends. Because run percentages across zones did not satisfy normality assumptions, the Kruskal–Wallis test was employed to assess differences in run distribution across zones.

## Results

Figure 2 presents the percentage distribution of runs and catches across the ten wagon-wheel zones in T20 cricket.

As shown in Figure 2, the bar chart illustrates the percentage distribution of runs and catches across ten wagon-wheel zones in T20 cricket. Run percentages are represented by blue bars, while catch percentages are shown in orange. Analysis of zone-wise trends shows that Zone 3 contributes the highest proportion of runs at 12 percent and also exhibits the highest catch percentage at 19 percent. This pattern indicates that Zone 3 is both a productive and high-risk scoring area. In contrast, Zones 6, 7, and 9 show very low catch percentages of 0 percent, 3 percent, and 3 percent, respectively, despite moderate run contributions. This suggests that these zones are relatively safer for batsmen. Zones 1, 2, 4, and 10 display a more balanced distribution of runs and catches. When considering risk and reward patterns, zones with both high run and catch percentages, such as Zone 3, represent high-risk, high-reward areas. Zones with moderate run contributions and low catch percentages, including Zones 6, 7, and 9, function as lower-risk scoring areas. Overall, the distribution shown in Figure 2 indicates that runs are scored relatively evenly across the field, whereas catch-outs are concentrated in specific zones.

Table 1 presents the distribution of catch outcomes across the ten wagon-wheel zones in T20 cricket.

As shown in Table 1, the crosstabulation of catch outcomes across the ten wagon-wheel zones reveals clear directional variation in dismissal likelihood. No-catch events were more uniformly distributed, with counts closely matching expected frequencies across all zones. This pattern indicates no directional bias in general shot dispersion. In contrast, catch events

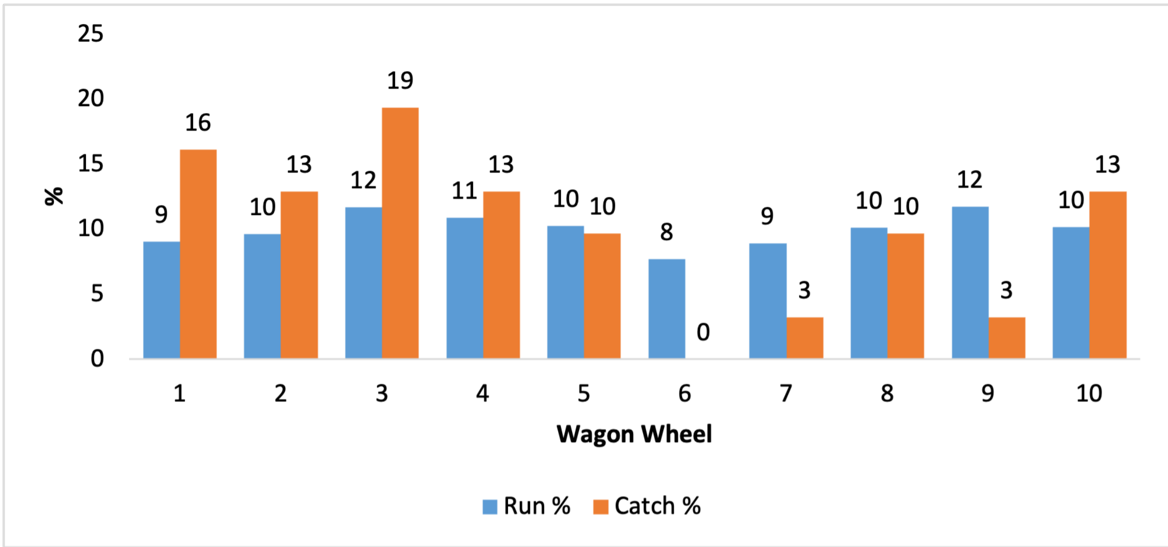


**Figure 2.** Run and catch distribution across wagon-wheel zones in T20 cricket in percentages

**Table 1.** Distribution of catches across wagon-wheel zones in T20 cricket

**Catches * Wagon Wheel Crosstabulation**

| Catch outcome (observed and expected counts) | | | Wagon Wheel | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Third Man | Point | Extra Cover | Cover | Long-Off | Long-On | Wide Mid-Wicket | Mid-Wicket | Square Leg | Fine Leg | Total |
| Catches | No catch | Count | 5 | 6 | 4 | 6 | 7 | 10 | 9 | 7 | 9 | 6 | 69 |
| | | Expected Count | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 69 |
| | Catch | Count | 5 | 4 | 6 | 4 | 3 | 0 | 1 | 3 | 1 | 4 | 31 |
| | | Expected Count | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 31 |

Nite. * Observed counts and expected counts are presented for each wagon-wheel zone. Expected counts were calculated under the assumption of independence between catch occurrence and fielding zone, as required for Pearson's chi-square analysis.

showed notable deviations from expectation in several regions. Catch frequency was higher than expected at Extra Cover (6 vs. 3.1) and Third Man (5 vs. 3.1). This suggests that these zones function as comparatively higher-risk scoring areas. Conversely, Long-On (0 vs. 3.1) and Square Leg (1 vs. 3.1) recorded fewer catches than expected. This indicates comparatively safer scoring angles in this dataset. Overall, the pattern shown in Table 1 suggests that aerial or mistimed shots directed toward off-side deep and backward regions are more prone to dismissal. On-side areas, particularly Long-On, received disproportionately fewer catches relative to expectations.

Table 2 summarizes the results of the chi-square analysis examining the association between catch outcomes and wagon-wheel zones in T20 cricket.

As shown in Table 2, the Pearson chi-square test ($\chi^2$ = 15.381, df = 9, p = 0.081) indicates that the association between catch outcomes and wagon-wheel zones is not statistically significant at the 0.05

**Table 2.** Chi-Square analysis of catch outcomes across wagon-wheel zones in T20 cricket

| Test | Value | df | Asymp. Sig. (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 15.381[a] | 9 | 0.081 |
| Likelihood Ratio | 18.678 | 9 | 0.028 |
| Linear-by-Linear Association | 4.557 | 1 | 0.033 |
| N of Valid Cases | 100 | | |

Note. a. Ten cells (50.0 percent) have expected counts less than 5. The minimum expected count is 3.10.

level. This suggests that, overall, catch occurrences are not strongly dependent on shot direction. However, the Likelihood Ratio test ($\chi^2 = 18.678$, df = 9, p = 0.028) and the Linear-by-Linear Association test ($\chi^2 = 4.557$, df = 1, p = 0.033) indicate the presence of directional or ordinal trends between zones and catch probability. It should be noted that, as reported in Table 2, 50 percent of the cells have expected counts below 5, with a minimum expected count of 3.10. This requires cautious interpretation because violations of chi-square assumptions may affect the stability of the p values. Overall, while no strong global dependence is observed, certain zones, such as Extra Cover and Third Man, may still present elevated catch risk, consistent with the observed frequency patterns.

Table 3 presents the results of the Kruskal–Wallis test examining differences in run distribution across the ten wagon-wheel zones in T20 cricket.

**Table 3.** Kruskal–Wallis test of run distribution across wagon-wheel zones in T20 cricket [a,b]

| Statistic | Runs |
|---|---|
| Chi-Square | 7.843 |
| df | 9 |
| Asymp. Sig. | 0.550 |

Note. [a] = Kruskal–Wallis test. [b] = Grouping variable: wagon wheel. The significance level was set at 0.05.

Table 4 summarizes the zone-based efficiency and risk metrics, including Shot Efficiency Ratio (SER) and Zone Risk Index (ZRI), calculated for each wagon-wheel zone.

**Table 4.** Shot efficiency ratio (SER) and zone risk index (ZRI) across wagon-wheel zones

| Zone | Runs (%) | Catch (%) | SER | ZRI |
|---|---|---|---|---|
| 1 | 10 | 7 | 1.43 | 0.70 |
| 2 | 9 | 6 | 1.50 | 0.67 |
| 3 | 12 | 19 | 6.3 | 1.58 |
| 4 | 11 | 4 | 2.75 | 0.36 |
| 5 | 10 | 3 | 3.33 | 0.30 |
| 6 | 8 | 0 | 8.0 | 0.00 |
| 7 | 9 | 3 | 3.0 | 0.33 |
| 8 | 11 | 3 | 3.67 | 0.27 |
| 9 | 9 | 3 | 3.0 | 0.33 |
| 10 | 9 | 4 | 2.25 | 0.44 |

As shown in Table 4, zone-based metrics reveal clear efficiency and risk patterns in the Bangladesh men's T20 performance. Zone 3 recorded the highest catch percentage at 19 percent and an SER of 6.3, indicating a high-risk, high-reward scoring area. In contrast, Zones 6, 7, and 9 combined low catch percentages ranging from 0 to 3 percent with relatively high SER values between 3 and 8. This pattern indicates safer scoring zones with efficient run accumulation. The remaining zones showed moderate SER values from 1.43 to 3.67 and ZRI values below 0.70, reflecting more balanced risk and reward profiles.

Overall, as indicated in Tables 3 and 4, the performance analysis of the Bangladeshi men's T20 team highlights consistent run distribution alongside zone-specific variations in dismissal risk. Runs were distributed relatively evenly across the ten wagon-wheel zones, with Zone 3 contributing the highest proportion at 12 percent. However, catch occurrences were more concentrated in certain areas, particularly Zone 3, as well as Extra Cover and Third Man, while Long-On and Square Leg showed fewer catch events. Although Pearson chi-square analysis did not indicate a statistically significant overall association between catches and zones, supplementary tests suggested the presence of directional trends. Together, these findings illustrate typical T20 risk and reward patterns, where run scoring is broadly distributed but dismissal risk varies across fielding zones.

## Discussion

The aim of this study was to compare run distribution patterns and catch-out dynamics of the Bangladesh national T20 cricket team with those of elite global performers in order to characterize scoring efficiency and dismissal risk across fielding zones. The results indicate that run scoring by the Bangladeshi team was relatively evenly distributed across the ten wagon-wheel zones, with no statistically significant differences in run frequencies between zones. At the same time, clear zone-specific variations were observed in catch-out occurrences and efficiency–risk metrics. In particular, certain zones combined higher run contributions with elevated catch risk, while others offered comparatively safer scoring opportunities with lower dismissal probabilities. These findings highlight that, despite an overall balanced scoring distribution, dismissal risk in T20 cricket is not uniform across the field and is closely linked to shot direction and fielding structure.

The study found that the Bangladeshi men's T20 team scored runs evenly across the field, with no single area dominating. This pattern reflects a strategic diversification of shot placement rather than reliance on specific hot zones. This observation aligns with previous research indicating that successful T20 teams distribute scoring to maximize run output while reducing predictability [14, 15].

However, catches were concentrated in off-side deep areas, particularly Extra Cover and Third Man. This pattern highlights a clear risk and reward tradeoff associated with aggressive shot selection. Boundary-oriented strokes, such as cover drives, cuts, and lofted drives, are more likely to result in dismissals. This is consistent with the speed and accuracy tradeoff in cricket, where faster scoring increases the likelihood of mistimed or edged shots [16, 17].

Although Pearson's chi-square and Kruskal–Wallis tests did not indicate a strong global association between field region and catch occurrences, this outcome may be related to low catch counts per zone and contextual variability. At the same time, the Likelihood Ratio and Linear-by-Linear Association tests suggested higher dismissal risk in off-side deep regions. This finding reinforces the tactical relevance of these areas as zones of increased risk [18, 19].

From a performance analytics perspective, combining wagon-wheel shot mapping with dismissal tracking provides more detailed insight than aggregate metrics alone. This approach captures both scoring efficiency and wicket risk [20]. From a practical standpoint, batsmen may prioritize safer zones, particularly on-side regions, to manage risk while selectively targeting off-side deep areas for aggressive scoring. Similarly, fielding strategies may emphasize positioning in higher-risk zones to increase wicket-taking opportunities.

These findings should be interpreted with caution due to the limited dataset of 10 matches and the absence of control for contextual factors such as bowling type or pitch conditions. Such factors are known to influence shot selection and outcomes [21, 22, 23]. Overall, while run scoring was broadly evenly distributed, dismissal risk remained dependent on fielding zone, particularly in off-side deep regions. This pattern underscores the importance of risk-aware shot placement and fielding strategies in T20 cricket.

The observed efficiency and risk patterns across wagon-wheel zones are consistent with broader evidence showing that key performance indicators significantly influence match outcomes in T20 cricket. Previous research has shown that total runs scored and boundary frequency are among the most consistent discriminators of performance in limited-overs formats. These findings emphasize the role of spatial and scoring dynamics in batting effectiveness [24]. The high risk and reward profile of Zone 3, reflected by a relatively high Shot Efficiency Ratio of 6.3 and a Zone Risk Index of 1.58, illustrates the tactical tradeoffs inherent in aggressive shot selection. This observation is consistent with evidence indicating that scoring rates and dismissal probabilities are closely linked in T20 play [24]. In contrast, Zones 6, 7, and 9 demonstrated efficient run accumulation with minimal catch risk, as indicated by Shot Efficiency Ratio values between 3 and 8 and Zone Risk Index values below 0.33. These results highlight the strategic value of targeting safer scoring areas under pressure. Zones with intermediate Shot Efficiency Ratio and Zone Risk Index values further support the need for contextualized performance metrics that integrate scoring potential and dismissal risk. This perspective has also been emphasized in performance indicator research in T20 and One Day International formats [25]. Together, these findings support the use of zone-based analytics to inform tactical decisions and optimize batting strategies in fast-paced cricket formats.

Overall, these results link scoring patterns with dismissal risk and provide a clearer representation of batting effectiveness. Players may apply this information to make more informed decisions when choosing between safer and more aggressive shots. Coaches may use these insights to design targeted training interventions and tactical plans aimed at improving decision-making and overall T20 performance.

*Limitations*

The study is limited by its focus on the Bangladeshi men's team, which restricts the generalizability of the findings to other teams or genders. Some fielding zones recorded very few catch events, which reduced the reliability of certain statistical tests. In addition, external factors such as pitch conditions, bowler type, and match situation were not considered. Qualitative aspects, including shot selection and player strategies, were also not analyzed.

## Conclusions

Overall, the analysis of the Bangladeshi men's T20 performance reveals important fielding and scoring patterns. The Bangladeshi men's team scored runs relatively evenly across the field, although some areas were associated with higher dismissal risk. Shots directed toward Third Man and Extra Cover resulted in more catches, increasing the likelihood of dismissal. In contrast, Long-On, Mid-Wicket, and Square Leg were associated with lower catch frequency and offered safer scoring opportunities. Recognition of these patterns may support batsmen in selecting safer scoring areas and assist fielders in focusing on higher-risk regions. These findings provide evidence-based insights that may inform coaching decisions, batting strategies, and field placements in T20 cricket.

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## Conflict of Interest

The authors declare no conflict of interest.

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